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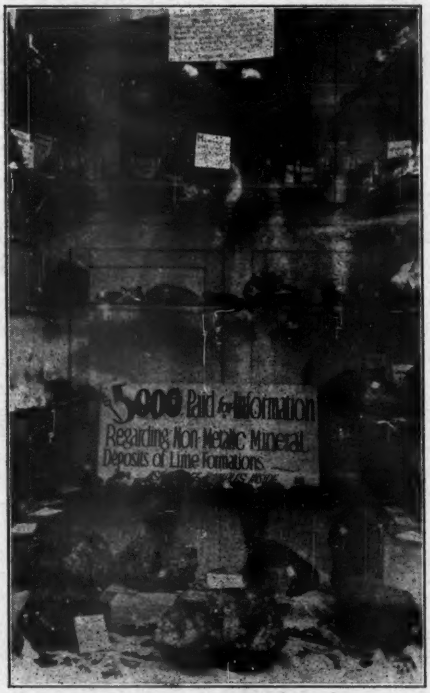
ROCKS and MINERALS

Vol. 3 JUNE, 1928 No. 2



SEE PAGE 56.

THE MAGAZINE FOR COLLECTORS

THE BULLETIN BOARD

OUR AIM

We wonder how many of our subscribers realize how valuable the articles are which are now appearing in ROCKS and MINERALS. Many of them are actual lessons in some branch of the fascinating study of mineralogy. This issue marks the beginning of another series — the identification of minerals by polishing and etching with acids, a method which we are sure some of our readers will wish to try. We should like to hear from them as to the success they may have in this interesting form of identification.

We feel that ROCKS and MINERALS has really assumed an important place in the literature of mineralogy. The articles appearing in each issue are prepared with a view of giving information in nontechnical language which every reader will be able to understand.

Our contributors are for the most part professional men and women thoroughly conversant with their subject, or they could not present them in an interesting manner and in a style free of technical expressions. They have grasped the idea of ROCKS and MINERALS and write with a full understanding of needs of the amateur collector, and at the same time their articles are rich in material of interest to the advanced collector.

We believe that ROCKS and MINERALS is the only magazine in America that is presenting the subject of mineralogy in this interesting manner, and that it is the only magazine published in America which is devoted entirely to minerals and mineral collecting from a collector's standpoint. To our knowledge no similar magazine has been printed for at least 20 years treating these subjects in an untechnical style and manner as we present them. Our aim is to revive the fascinating study of minerals which seems to have almost disappeared, and to make it as popular as the study of birds or any other nature subject.

While a particular issue of the magazine may not appeal to the reader because his special subject may not be treated therein, we trust that our subscribers will endeavor to preserve complete files of ROCKS and MINERALS, for at some future time reference through back numbers will be desirable, especially when the collector, who is a specialist, has had his interest awakened in minerals outside of his particular field. We therefore urge our subscribers to obtain all back numbers now, while these are still available, so that their files may be complete.

WANTED: Correspondents in all parts of the world who will be kind enough to send us notes and news items on minerals, etc., that they think may be interesting to the subscribers of "Rocks and Minerals." Such as are available we shall be very glad to print in the magazine.

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ROCKS AND MINERALS

The Magazine for Collectors

Published Quarterly

Peter Zodac
Editor and Publisher

The Official Journal of The Rocks and Minerals Association

Vol. 3 JUNE, 1928 No. 2

CONTENTS

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ROCKS AND MINERALS **PEEKSKILL, N. Y., U. S. A.**

SOME MINERAL LOCALITIES IN ORANGE COUNTY, N. Y.

By Charles W. Hoadley

Possibly the best known mineral localities in Orange County, N. Y., are Edenville and Amity.

Dana gives under these localities, the following minerals: *Spinel, garnet, scapolite, hornblende, idocrase, epidote, clintonite, magnetite, tourmaline, warwickite, apatite, chondrodite, pyroxene, rutile, ilmenite, zircon, corundum, feldspar, sphene, calcite, serpentine, muscovite, tremolite, arsenopyrite, orpiment, scorodite, chalcopyrite, yttrocerite, leucaugite,* and *allanite.*

The Amity and Edenville localities are situated in the Goshen Quadrangle which adjoins Franklin Furnace to the south, and the Greenwood Lake section to the east; in fact, some authorities include them in the Franklin region. A study of the rocks in the vicinity of Amity leads to the realization that they are essentially the same as the Franklin limestone with invading hills of granite such as Mt. Adam and Mt. Eve.

The limestone forms a band 22 miles long extending from Mts. Adam and Eve in a southwesterly direction to Sparta, N. J., and is cut by irregular dykes of pegmatite. The rock is very highly metamorphosed, and is distinguished from the gneiss as being composed largely of calcite.

A few years ago Dr. Finlay of New York University and the writer, made a trip through a number of Orange County localities. Our first stop was at the Sterling mines, a few miles southwest of Tuxedo. This mine is located in the New Jersey highlands, or more popularly called the Ramapo Mountains, on the shore of Sterling Lake. *Magnetite* occurs here in pegmatite, distorted crystals were observed but were not abundant. *Pyrite, epidote, calcite,* and *serpentine* were collected.

The following day we proceeded to Edenville. Thanks to the courtesy of Mr. James Manchester of Scarsdale, N. Y., and a certain farmer of the vicinity, we were able to identify and visit some of the old localities. One of the best spots for collecting is about one-half mile southwest of Amity. The boulders contain considerable *chondrodite* and the usual metamorphic minerals, *phlogopite,* and *augite,* also *molybdenite* and *arsenopyrite.* The same minerals are found in the stone walls one-fourth of a mile north of Amity. Two and one-half miles northeast of Amity, there are more boulders and ledges containing metamorphic silicates. Here was found the original pale-green or gray *hornblende* named *edenite* and it can still be obtained. This brings you to the southern tip of Mt. Eve where *tremolite* was found in a stone wall. By going northwest to the gap between Mt. Adam and Mt. Eve other masses of mineral-bearing rock will be observed. On the east side of Mt. Adam is a granite quarry where *molybdenite* and *yttrocerite* were once found but unfortunately we were not successful in finding any. The old time *spinel* crystals are very rare and we were not successful in collecting any larger than one-half inch in diameter. Both Amity and Edenville are stone wall mineral localities at the present day.

Near Edenville is a locality called locally "Gibraltar" because of an interesting faulted pegmatite outcrop, where in the old days spinel crystals were collected by Jenkins. We were guided to these prospect holes by an inhabitant who knew Jenkins when he was a boy. There were probably seven or eight of these small excavations in the woods.

The following day we visited the O'Neil mine, three miles south of Monroe, where splendid octahedra of *magnetite* were collected. We also visited some localities near the shore of Lake Mombasa. The country in the vicinity is very beautiful and I would recommend it as a camp site, for anyone who wished to do any fishing, or hunting of game or

minerals. The same day a locality was visited in Central Valley where the new state road cuts through the shoulder of Stockbridge mountain about one mile east of the village of Central Valley. Pegmatite is encountered in the gneiss containing *pyroxene, hornblende, scapolite,* and green *feldspar.*

The next morning we visited the Queensboro biotite locality where fine partings of *biotite* and *graphite* were found. The afternoon was spent at the "Forest of Dean" mine, back of Fort Montgomery, which was not in operation for the first time in a number of years. The ore from this mine is transported by a narrow gauge railroad a distance of two miles from the mine where it is transferred to aerial buckets which carries it for another mile to the Hudson River dock at Fort Montgomery. The ore at this mine is a crystalline *magnetite* of very rich quality, running from sixty to seventy per cent iron, approximately. It contains *epidote* in considerable quantities and good specimens of it, and *pyrite* in modified cubes, were found, but *magnetite* crystals are rare.

On the following day we made a direct run to McAfee over the route we had traversed the previous day, via Central Valley and Warwick. After a brief visit to McAfee, where *fluorite octahedra* were collected, also brown *tourmaline, hornblende, scapolite,* etc., we proceeded to Franklin, N. J.

SOME MINERALS OF BORNEO

By EDWARD CAHEN, A.R.C.Sc., F.I.C., F.C.S.
(*Author of "The Mineralogy of the Rarer Metals"*)

One of the greatest pleasures the collector of minerals can experience is the arrival of a consignment of specimens from some far away and little-known locality. Some few years ago I had the good fortune to receive such a selection from the Island of Borneo, which is in the Dutch East Indies. These minerals were given to me by Dr. Hose, who for many years was the administrator for the Rajah of Sarawak, an Englishman, who rules a small portion of the island.

Borneo is divided into four sections, Sarawak, Brunei, British North Borneo (the three owned by Great Britain), and Borneo proper, the latter section being the largest of the four and is owned by the Netherlands.

At first one may be somewhat surprised to hear that an island, through which the equator actually passes, should produce minerals, but not only does Borneo produce minerals but they have been and still are mined in commercial quantities.

The chief mineral product obtained in Borneo is oil and one can hardly expect to obtain a crystalline specimen of this for his collection. Sarawak Oilfields, Ltd., at Miri, under a concession from the Sarawak Government, is doing a very large business in this precious fluid. I understand oil is being prospected for in British North Borneo as well.

Excellent coal is found in many parts of the island. In Sarawak it is mined on a small scale for local purposes only. In British North Borneo, The Cowie Harbor Coal Company have an up-to-date plant with an annual output of some 85,000 tons. The coal has good steam qualities and most of it is taken by the Japanese Navy, the remainder being used for fueling ocean steamers, etc. The mines are situated at some considerable distance up the Silimpopon River and in the midst of a dense forest. The coal is brought down to the river's bank by rail and reloaded into sea-barges and the barges are towed to the coast.

Gold is perhaps the mineral of greatest importance, being found as a fine sand in many parts of the island, but it is no longer worked on a large scale. Individual Chinamen still wash for gold in the alluvial deposits and in the river gravels. In times past, however, there was a flourishing gold mine at Bau, Sarawak, which was worked by The Borneo Company, Ltd., from 1898 to 1921, during which period they recovered some 40,000 ounces of gold. The ore was dug out from a hill, the greater part of the hill being subsequently removed, and later the mining operations were carried down to a considerable depth until flooding and other difficulties made it an unpayable proposition, so the mines had to be abandoned. At the present time gold is being prospected for in the Darwell Bay district of British North Borneo but with what success it is too early to say. A very nice little waterworn nugget from Bau was one of the specimens given me by Dr. Hose.

While on the subject of precious metals I might say in passing that the very rare mineral Laurite (Ruthenium sulphide) is mentioned as occurring in the platinum washings from Borneo, so evidently platinum is also found on the island. The only other locality where Laurite is known to occur is in Oregon, U. S. A.

Antimony is perhaps the metal of next importance, and occurs chiefly as Stibnite (Antimony sulphide). Stibnite is found in the limestone districts in clay boulders and rocks lying upon the surface of the ground. At one time the mining of Stibnite was an important industry, the Borneo Company, Ltd., worked the valuable deposits for many years and selling the ore in England. In the assortment of minerals received from Dr. Hose was a fine series of Stibnites from various localities on the island. Some were large crystals of pure stibnite, others were lovely long needles imbedded in clear calcite, and bands of stibnite in limestone, etc. All of these specimens came duly labelled "antimony" with their exact locality in Sarawak where they were found. One specimen had a very different appearance from the rest, it being silvery and micro-crystalline. For a while it puzzled me and I set it aside for the time being, but later it occurred to me that it must be native antimony. I turned up Antimony in my little—Rutley—and sure enough Borneo was mentioned as one of the special localities where this rare mineral is found. In tests later on, this mineral proved that it was indeed native antimony. Later I questioned Dr. Hose about this specimen, he had not realized the difference as he is no mineralogist, and he told me the natives were well aware of it and called it "white antimony" in reference to its silvery color, and sought it eagerly due to the higher price it brings than the ordinary stibnite. At one time the mining for stibnite and antimony formed quite an industry but now export of these have entirely ceased.

Another native metal which occurs in seemingly large quantities on the island is mercury. I have a small quantity which Dr. Hose said came gushing out of a rock in quantity, the rock was being bored to receive a charge of powder for blasting. This rock was cinnabar of fine quality and a nice specimen of it was sent me also.

Two other choice minerals that I received and with which I was delighted were realgar and mammillated pyromorphite. The pyromorphite came from the extensive Jambusan Caves in Sarawak.

Silver, lead, tin, iron and copper are also reported from the island but none of them appear to have been worked on a commercial scale.

Diamonds, too, have been found and the "Star of Sarawak," one of the world's famous stones, was found in Sarawak many years ago but no systematic search for them is at present being made.

The world's greatest deposit of nickel is at Sudbury, Ontario, Canada, where the ore is mainly pyrrhotite, chalcopyrite, and pentlandite. Next to Sudbury, New Caledonia, a French island in the South Pacific Ocean, is the most important source of nickel in the world. The island consists of ancient schists and Mesozoic sediments, pierced by eruptives, especially peridotite. The latter is more or less altered to serpentine. The ore minerals are hydrated silicates, chiefly garnierite. They occur as veinlets and concretionary masses in the serpentine and peridotite. The Gap Nickel Mine, near Lancaster, Pa., was a famous American deposit but the mine is worked out. The ore was a nickeliferous pyrrhotite. It was actively worked from 1863 to 1880 and during that time was the only nickel ore mined on this continent.

Ries'—*Economic Geology*.

THE STORY OF GOLD

By Frederick A. Burt

The glitter of gold in the ancient world was as real as in the modern. The first mines of which history holds record were in Armenia, Chaldea, and Egypt. Five centuries before Christ several great mining areas had been developed in Asia Minor. The powerful ancient nations of Babylon, Chaldea, Egypt, and Persia, were rich in gold which was utilized for the creation of wealthy governments supported by armies of slaves. The Greek states and Rome, poor in gold, on rising to power accumulated vast amounts by mining in conquered territory or demanding tribute from vanquished states.

Alchemy, the forerunner of modern chemistry, was in the middle ages much concerned with the change of the base metals into gold. So pronounced was this search for gold among the alchemists of the middle ages that we have come to think of alchemy only in terms of its experiments in attempting to produce gold. The science of alchemy probably arose among the ancient Greeks in the early centuries of the Christian era, and was adopted from them by the Arabs by whom it was carried to western Europe.

Although occurring in small amounts in widely distributed areas throughout the world the centers of gold production are few and deposits represent a precarious and temporary source of wealth.

The metal most usually occurs in a free or so-called native condition, that is not in chemical combination with any other substance. Good crystals are small and very rare, cubical or octagonal in shape with edges rounded. In sands and gravels the metal is generally found as grains, scales, and nuggets, while in hard quartz rock the gold is frequently in veins or irregular patches.

The largest single mass of gold ever found was unearthed in 1869 in Victoria, Australia, and weighed 156 pounds, being valued at $46,400. Gold is never found pure but always mixed with considerable earthy or rock material and usually with from 1 per cent to 38 per cent of silver.

The only frequent chemical compound in nature is gold telluride. It is a compound of gold and tellurium, an element somewhat resembling sulphur. It is found in large quantities in the famous Cripple Creek mining district of Colorado.

Gold mining may be grouped into three classes:

1. Panning of river and beach sands.
2. Hydraulic mining.
3. Hard rock mining and quarrying.

The simplest process of panning consists of shoveling beach or river sands and gravels which contain grains of gold into a pan, partly filling the pan with water and shaking until the heavier gold particles have settled to the bottom when the water, sand, and gravel is poured off leaving the gold grains and fine sand in the pan. An elaboration of this method, developed by prospectors where sands and gravels prove to be rich, consists of rigging up a series of cradles, or boxes, automatically rocked by a small water-wheel or wind mill and operating on the same principle as a pan. Sometimes a box with strainers at the end and the bottom covered by riffles resembling a washboard is so placed as to allow the gold-bearing sands to wash through it. The heavy particles drop and are caught behind the riffles while the sands wash away. Such a box is known as a "Long Tom."

Hydraulic mining consists of washing gold-bearing gravels with streams of water directed under great pressure against the gravel deposits. The gravelly waters coming from the deposits are directed through wooden sluices which consist of long troughs with riffles on the bottom. The gold particles are retained while the gravel is washed away as in the "Long Tom." Deposits of gold-bearing sands and gravels have all been made by the decay and erosion of hard rock, the gold of the rock not being susceptible to decay and being heavier than the other rock particles remain behind and becomes concentrated in amounts sufficiently rich to be mined with profit.

Hard rock mining consists of drilling, blasting, and digging the quartz containing the gold from the lodes or veins extending irregularly through the rock. Vertical shafts may be put down from which extend galleries or tunnels which follow the different levels of gold veins. Where the ore is found outcropping on the mountainside the simplest method is to follow the deposit back into the mountain through galleries, or drifts as the tunnels are known.

The extraction of gold includes three processes:

1. Mining by one of the methods described above.
2. Mechanical crushing.
3. Metallurgical dressing.

The mechanical crushing is usually accomplished in two stages. First the ore is passed through rock-breakers of the jaw type such as are used for the ordinary crushing of limestone for road ballast. These jaws are commonly so set as to reduce the pieces to a maximum size of two or three inches across. The crushed rock is then transported to the roof of a stamp mill, popularly known as a "California mill." From the top of this mill the crushed rock is dropped to a position behind a row of stamps, mixed with abundant water, and washed into mortars under the stamps. Each stamp consists of a steel cylinder, varying in weight from eight hundred to twelve hundred pounds, which rises and falls with a rotary motion at the rate of about ninety strokes per minute. The finely pulverized material from these stamps washes through screens and is known in the mill as pulp.

The gold and the rock in the pulp may be separated by amalgamating, cyaniding, or roasting. The simplest of these processes, which is amalgamating, is possible only when the gold is in a condition known as "Free milling," that is not chemically combined with any other elements nor mixed with any appreciable amount of material containing sulphur. The process consists of washing the pulp over copper plates painted with mercury. The gold in the pulp and the mercury on the plate mix with one another forming an amalgam similar to that formed when a drop of mercury falls upon a gold ring or watch case. The amalgam thus formed is later heated to a sufficiently high temperature to evaporate the mercury leaving the gold on the copper plates.

In cyaniding, or the cyanide process as it is called, the pulp is collected in large vats of wood, or possibly sheet steel. Into these vats is placed enough potassium cyanide to make a weak solution which dissolves the gold. From the solution the gold is deposited by an electric current. This method of extraction is an excellent one for the treatment of ores which are not free-milling and therefore cannot be treated by the amalgamating process but in which the gold is not chemically combined with some other element.

The roasting of ore is illustrated in the mills at Cripple Creek, Colorado. There the gold is chemically combined with tellurium into telluride. The telluride is first crushed by the ordinary methods already described and then the crushed ore roasted in great ovens. The roasting process breaks up the telluride into its constituent parts thus liberating the gold.

In modern industry gold has a great variety of uses.

The pure metal is very soft and to make it hard enough for use in coins and jewelry it is alloyed with various base metals, chiefly copper and silver. The amount of gold in such an alloy is expressed in carats. A carat means one part of gold out of every twenty-four parts of the alloy. Thus 16 carat gold means 16/24 gold and 8/24 base metal. 22 carat accordingly means 22/24 gold and 2/24 base metal.

Among the most common uses of gold are its employment in coinage and the manufacture of jewelry. Large amounts, however, are required in many other industries, notably dentistry, pen manufacturing, photography and photographic supplies, chemical manufacturing, and the making of gold leaf for gilding, decorating, and book illuminating.

Within the last few years there has been much reference to a recent discovery by Adolph Miethe, a German scientist, of a method for creating gold from mercury. The creation seems to have been actually accomplished by Professor Miethe who accidently stumbled on the process while engaged in experimenting on ultra-violet light. Fortunately this creation of the metal is so expensive and slow, and the amounts obtainable so minute as to make manufactured gold at present only a scientific curiosity and no menace to our wealth and prosperity.

THE CHARMS OF MINERALOGY

Miss Betty Browne
33 Emerson Avenue, Pittsfield, Mass.

Miss Betty tells of the fascinations, thrills and knowledge to be acquired in the most worthwhile hobby in the world.—Editor.

It is my firm belief that in the near future Mineralogy is "coming into its own"; taking the lead among all other hobbies, where it belongs. The popularity of stamp collecting, coin collecting, etc., cannot endure unchallenged forever when mineralogy, for several reasons, is far superior to them all. Soon the public will awaken to the realization that this hobby, previously so little known, is actually preferable to any other. But why? This is just what I shall attempt to explain, elaborating on the ability of the Mineral Collection to take one to foreign lands as no other collection can.

Mineralogy is far more than a charming study and a pleasurable pastime; it is a companion, friend, and teacher. I can truthfully say that I have "gazed upon the sands of the Red Sea" (for I have a small bottle full) and I have "beheld the rocks of the imperial Andes (I have a specimen from there). So my collection can take me around the globe (in fancy at least). That tiny, brown corundum crystal from "The Dark Continent," regardless of time and space, will bring me to its far off land. Half closing my eyes, I have visions of the impenetrable jungles, infested with savage beasts and equally as savage men; delicately beautiful, weirdly formed parasites—orchids, in whose fantastic shapes are seen the colors of the rainbow; and barbaric cannibals whose gleaming, ebon hides and flashing, filed teeth, gleam fantastically as they dart wildly about the flickering fires, their sinewy arms and legs adorned with bands of native copper as well as ropes of rough gems that would delight the heart of the Mineralogist. All these, and more, pass in kaleidoscopic panorama before my eyes, but when I open them, the pictures vanish and I find myself again surrounded by the everyday, unadventurous world.

The curio collector will defend his hobby, saying that minerals cannot take you into the depths of the sea as can his sea curiosities. But what of petrified coral and fossil shells? A petrified shell found on a mountain top tells a thrilling story of long ago when the world was young and infested with nightmarish prehistoric monsters, combined with steaming and stagnant seas from which all shells (except those petrified which were lifted to high levels by some titanic upheaval) have long since vanished. A curio collection is all right for one who cares for a little bit of everything, but its one great weakness lies in the fact that no one thing receives concentrated study and attention. The most delicate carving owned by the lover of curios cannot compete with the perfection of some crystal formations. The handiwork of man, no matter how fine, can hardly be compared with the accomplishments of Nature.

The coin collector will rave over an ancient Roman coin, misshapen and wholly unattractive, when there are beautiful minerals, even more ancient from the same place—and made by Nature not by crude man. What a story those rocks might tell could they but speak! They have beheld Rome at the height of its glory and, also, its mighty fall took place before them. But both, coins and stamps, unfortunately, may be made of materials foreign to the country they represent, or may even have been manufactured outside of the land in which they circulate; while a mineral is a very part of the land from which it comes and, for this reason, it is logical that such a specimen should more readily be able to bring to us the lure of its former surroundings.

A shell from Ceylon, found on the beach, will perhaps bring to its owner ideas of the island where it was found when it may have been carried for miles along the sea-bottom by tides or currents before it was finally washed ashore; but a mineral, let us say a moonstone-pebble, gives us no false impressions. While gazing abstractedly into its milky depths, pictures of the tropical sun and bathing nut-brown pearl divers, seem to appear and disappear within it, while huge

sharks dart through the imaginary crystal-clear waters, their dorsal fins betraying their presence to the wary gem seekers. Oh! The wonder of it all! The weird beauty! And you can witness it without experiencing any of the discomforts that would be only too real, were you in reality visiting these places. Your collection does it all as nothing else can.

The Far East, land of occult mysteries and marvelous gems of the emerald, the sapphire, and the ruby — stands before you unveiled. In the light of the flaming sunset in the ruby, you behold temples whose beauty taxes your credulity, but in the depths of which lurk huge, malformed idols in whose ugly foreheads repose precious stones worth fortunes, gleaming evilly, yet weirdly beautiful—as eyes. The tragedies of the primeval jungles make you shudder, but thrill you.

Without leaving the safety of your home you can visit that delicately etherial tomb—the Taj Mahal, which was erected during the first half of the seventeenth century by Shah Jehan for the body of his wife, Arjamand Banu; and history states that it required the labor of 20,000 workmen for 22 years, necessitating the expenditure of four million pounds sterling. It is of particular interest to the mineralogist for the reason that its beauty, to a large degree, is due to the whiteness of the marble of which it is composed, relieved by mosaics of precious stones. The columns and trellis work of the interior are inlaid most gracefully and elaborately in jasper, coral, bloodstone, onyx, turquoise, sardonyx, and the most precious of gems. Here again, one of the wonders of the world owes its glory to minerals which greatly enhance the beauty of its architecture. With a start you open your eyes to find yourself gazing dazedly at a piece of sandstone from there. Does it not indeed thrill you to realize that you are in possession of a part of this ancient land?

And so around the globe you can go, beholding weird rites and customs; visiting the great wonders of the world and penetrating into the depths of the most remote jungles. You can bask in the rays of the equatorial sun or witness the "midnight sun" in Norway. And, what is more, you have within your cabinet parts of these lands of which you dream.

In mineralogy, both work and play are combined. The excursions you take in search of minerals for your collection serve as pleasurable recreation, and with mineralogy as a door, one can enter into the fascinating realms of chemistry and geology — studies which tell us of the ever changing crust of the earth upon which we live. Mineral collecting is the embodiment of work and play, romance and travel, friend and teacher. It is within the power of all mineralogists to experience the joys and thrills that can only be produced by all other hobbies put together. Just give it a trial and see for yourself.

RECENT ACQUISITIONS TO THE MINERALOGICAL COLLECTION OF THE BRITISH MUSEUM (Natural History)

By An Official of the Museum

Beryl (*Aquamarine*). A clear, bluish-green crystal of gem quality, 13 cm. high and of 10-12 cm. diameter, and weighing 2505 grams (12,525 carats). From the pegmatite on Pingueira Mountain, near Santa Rita de Arassuahy, Minas Novas District, State of Minas Geraes, Brazil. This is a well-developed crystal and shows beautifully marked etch-figures on the faces; the edges are slightly rounded by corrosion, as it was evidently in the process of re-solution.

Topaz. A clear transparent crystal with a pale blue tinge of color, measuring 12x11x10 cm. and weighing 2290 grams (11,450 carats or just over 5 pounds). From the pegmatite at Tsaratanana, Maevatanana District, Madagascar, Africa. It is a well-developed crystal showing brilliant crystal faces that are marked by complex and intricate pyramids and lines of growth; the specimen is an instructive example of a crystal in which the process of growth has been abruptly arrested.

PALEONTOLOGY DEPARTMENT

Conducted by
BENJAMIN T. DIAMOND, M.A.

Mr. Diamond will gladly assist subscribers in identifying their fossil specimens or answering any questions pertaining to fossils. Please write to him direct, enclosing enough postage if a personal reply is desired, specimens returned, etc. Address all mail as follows: Benjamin T. Diamond, M.A., 467 Riverdale Ave., Brooklyn, N. Y.

CORALS

My readers have probably seen more fossil corals than any other fossils and are probably more familiar with the more recent forms, such as the "Brain Coral" or the "Venus Basket," than with the ancient forms.

Anthozoa (flowered animals) or Actinozoa (rayed animals) belong to Phylum III — the Coelenterata, and are important to the palaeontologist as horizon markers or index fossils, being represented by about ninety index genera.

The fossils in most cases are the calcareous skeletons which the polyps (fleshy part of animals) secrete. The polyps may be simple or give rise by division or budding to a compound polyparium. The hard parts or coralla, then, may be correspondingly simple or compound.

The body of the animal forms a cylindrical tube; the base of this cylinder forms the muscular disc of attachment. In the forward end of the body is an oval opening called the mouth surrounded by a number of hollow muscular tactile tentacles. The mouth opens into an oesophagus leading into the visceral chamber which is divided by mesentaries into a number of compartments.

The skeleton or corallum is the only part preserved and therefore the only part of importance to the palaeontologist. There are a number of parts to the corallum which must be defined before a discussion of the corals can be attempted.

As we look down into the calyx or cup like invagination of a simple coral in which the polyp sat or rested, we see a number of radial septa or calcareous sheets. These alternate with the mesentaries, so that by counting the number of septa, the number of mesentaries possessed by the animal is known. The edges of the septa are all bound together by a calcareous outer covering or theca. Looking at a side view of a coral, little ridges can be seen on the theca. These are known as costae. Concentric circles (growth lines) are also seen. Sometimes the septa thicken and almost fuse together giving the appearance of a theca. This thickening is called the pseudotheca.

Sclerites are little calcareous projections on the septa. Dissepiments are plates of material reaching from one septa to the next. Synapticule are rodlike projections reaching from one septa to the next one. Tabulae are flat plates extending from the center to the theca between two septa. Carinae are little plates straddling the septa very well illustrated in Heliophyllum and in Prismatophyllum.

The corals are divided into three main orders: (1) Tetracoralla — having four septa or multiples of four. Geologic range—Palaeozoic. (2) Hexacoralla—having six septa or multiples of six. Geologic range—Mesozoic to recent. (3) Tabulata—Septa poorly developed or absent; tabulae numerous. Geologic range —mostly in Palaeozoic — few in the Mesozoic.

TETRACORALLA

Zaphrentis gigantea—Onondago. Coral very large, usually a single cup; septa numerous, strong, thin, not reaching the center. Fossula large and deep. Epitheca strongly wrinkled.

Heliophyllum halli—Hamilton. Coral usually a single cup; septa numerous, slightly twisted near center of coral and

thickened on their sides by conspicuous vertical ridges (carinae). Epitheca (outer covering) strongly wrinkled.

Microcyclas discus—Onondago. Small, dish-like, calcareous plate with ridge like septa which unite before reaching the center. A fossula (groove where septa is missing) is present.

HEXACORALLA

This group includes the reef builders.

Septastrea marylandica — Miocene. Compound corals, with corallites prismatic from crowding. Calices of moderate depth with simple septa, the longer of which unite in the center, where they often form a pseudocolumella.

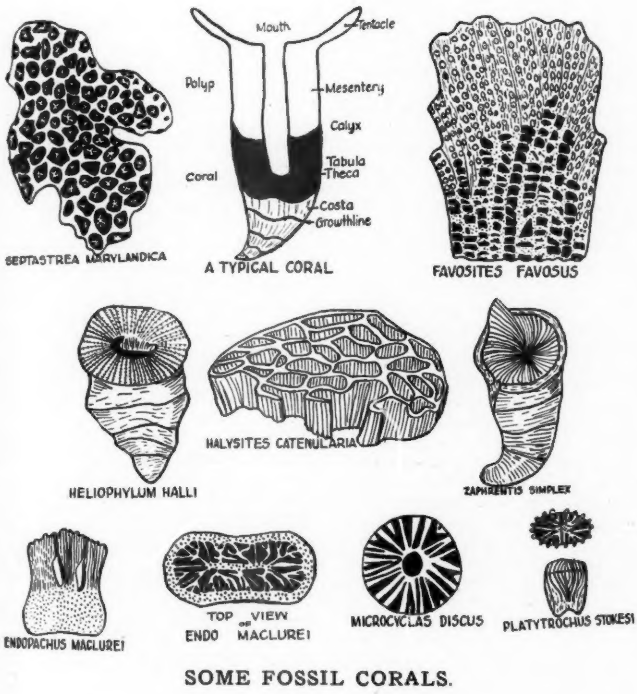
Platytrochus stokesi—Eocene. Small, with base drawn out into a wedge. Septa and costae 24, nine of which on the middle of each broad face, converge and unite downward, while those on either side become broader. Surface rough with granules. Columella papillose.

Endopachus maclurei—Eocene. Cuneate with subparallel margins, sides and ends rounded. Lateral wings well developed. Columella narrow and elongate in long axis.

TABULATA

Favosites favosus — Niagaran. Coral closely compound, with the corallites in contact but with separate walls. Corallites prism shaped. Septa usually lacking; tabulae numerous and conspicuous.

Halysites catenularia — Cobbleskill. Compound coral composed of laterally compressed corallites and covered by a peritheca. Septa absent; tabulae numerous. Commonly known as the "Chain coral."



SOME FOSSIL CORALS.

THE ORIGIN OF THE NATIVE METALS

By P. Walther
508 Muriel Parkway, Elizabeth, N. J.

Diamonds.—The mother mineral of the diamonds is the so-called "Blue ground." Melting "Blue ground" dissolves small diamonds and diamond-dust molten for some time together with "Blue ground" produces minute crystals of diamonds.

Sulphur.—There are four ways in which sulphur is produced by nature.

1. Sulphur is deposited in volcanoes by the condensation of sulphur fumes.
2. The main sulphur deposits like Cove Creek, Utah, and Girgenti, Sicily, etc., have been and still are formed by the oxydation of sulphuretted hydrogen.
3. Fairly large deposits of sulphur are due to the decomposition of gypsum by bacteria.
4. Small amounts of sulphur are formed by a reduction of sulphide ores as galena, etc.

Platinum, Palladium, Iridium, Osmiridium, Tantalum, and *Columbium.*—All of these metals have been separated out in the molten rocks, mostly in still semiliquid dunite. By the disintegration of these rocks the metals were washed out into river beds from which they are recovered by placer mining or dredging.

Tellurium.—This metal has very probably been produced by an electrical action of different metal-sulphides on tellurium salt solutions.

Gold.—1. Gold, which is nearly always found in the native state, has been produced by the action of silicate of sodium or calcium, etc., on solutions of gold-chloride, thus generating gold and quartz, etc.

2. A small amount of gold is due to the decomposition of auriferous metal-sulphides as iron pyrite, etc.

3. Traces of gold have been found in crevices of silicate crusts deposited by hot springs, Steamboat Springs, Queensland, Australia, being one locality. Here the gold separated out from a silicious gold solution.

Silver.—Native silver owes its existence to the decomposition of argentiferous copper or lead sulphides. Some is due to the reduction of argentite.

Copper.—Native copper is produced in three ways.

1. By the decomposition of copper sulphides.
2. A solution of iron sulphate precipitates metallic copper out of copper salt solutions.
3. Decomposing organic matter reduces the copper contents of copper-solutions to metallic copper.

Iron.—Iron in the metallic state is found in two forms.

1. As meteorites. Very likely from broken up planets. Meteoric iron is always combined with metallic nickel.
2. As terrestial iron. This has been formed by a natural smelting process, whereby the carbonaceous matter in the still fluid basalt, etc., reduced the iron-contents into metal. An example is the large block of iron found in Greenland.

Basaltic rocks often contain metallic iron in minute specks which can be recognized only by the impregnation with copper solution, iron when present as metal turns red, larger granules of iron in the basalt of Weimar near Cassel, Germany, and at other places.

Native iron in the form of minute crystals has been found associated with perlite (smelting process).

Lead.—This is very rare as a native metal. It has been produced by a reduction of a lead salt with an arsenious acid. Langban, Sweden, is an important locality for native lead.

Nickel.—Native nickel is not found by itself but only in combination with iron.

1. In meteoric iron.
2. Terrestial with about 70 per cent nickel and 30 per cent iron as awaruite and as josephinite with about 30.5 nickel, 23.23 iron, besides silica, serpentine, copper, cobalt, etc.

Bismuth.—Has been formed by electrical action of different metallic sulphides on bismuth-salt solutions?

Antimony.—Has been formed by electrical action on antimony salts.

Arsenic.—Has been formed by electrical action on arsenic salts.

Allemontite. — A combination of antimony and arsenic has been formed by a similar process.

Quicksilver (*Mercury*). — Has been precipitated out of mercury-silver-sulphide solutions:

1. By the action of water.
2. By reducing agents as carbonaceous or decomposing organic matter.

Amalgam.—A combination of metallic mercury and metallic silver and is produced by the action of metallic mercury on silver solutions.

The following minerals coming into contact with dissolved metallic salts act like a Volta column. The strongest action will be between Alabandite and Graphite, the next strongest current would be between Sphalerite and Graphite or Alabandite and Arsenopyrite, and so on, the weakest action is of course between two neighboring minerals. The chain is as follows: Alabandite, Sphalerite, Galena, Chalcocite, Chalcopyrite, Pyrite, Stibnite, Arsonopyrite and Graphite.

DISPOSITION OF MINERAL COLLECTIONS

By Albert C. Bates
Newark, N. J.

Last year two of the finest private mineralogical collections in the country were given by testament to the Smithsonian Institution, Washington, D. C., together with ample funds for their upkeep. These two collections were formed in New Jersey by Mr. Washington A. Roebling of Trenton, and Mr. Frederick A. Canfield of Dover.

That the Roebling collection should go to the Smithsonian Institution may be easily understood, but the Canfield collection should have remained in New Jersey, and of course such a bald statement must be explained. The writer knew both of these gentlemen but not at all intimately enough to have learned the probable disposition by them of their great collections. He had been invited by both to a private and prolonged examination of the collections which invitations were gladly accepted and with much profit. These collections differed greatly in at least one respect—towards completeness. The Roebling collection, doubtless, comprehended more than any other in the entire country a greater number of species and varieties; in a word it was as complete as time and money and constant effort could make it so; all of which is not a good reason why the collection should have been sent out of New Jersey but it is a sufficient reason why, by personal choice, it should go to a great national museum for a final resting place. The case is different with respect to the Canfield collection. The great nucleus of this collection was made by the testator's father, principally of the minerals found in the zinc mines of Sussex County, New Jersey. The specimens were unique as to quality and size. They had been mounted in glass front cases and sealed up to stand, as set up originally, for nearly fifty years. The son has as great a liking (love if you will) for minerals as had the father and constantly added to the collection. His preference was always for the minerals of New Jersey but choice crystallized minerals from distant points appealed to him also and he bought liberally. But still as a whole the collection was representative of the best specimens New Jersey afforded.

Once, while in general conversation with Mr. Canfield, I made bold to say that I hoped his collection would stay in New Jersey. His reply was, "There is no adequate place for it either at Trenton or Princeton." I then said that the Public Library at Newark has already a fair collection of minerals and there is some talk of a museum by the leading men of the city to house this collection. To this he made no reply nor did I again mention the matter to him. And this occurred only a few years before he passed away.

But the fact remains that before Mr. Canfield died, a museum building of fine proportions was begun, a building in every way dignified in itself and its management with possibilities to house and be a permanent home for the finest collections of minerals or anything else.

The writer regrets that Mr. Canfield did not know this, or appreciate it, when considering the final disposition of his very fine collection.

MICRO-CHEMICAL STUDY OF THE METALLIC ORES AND MINERALS

By Dr. H. C. Dake
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This is the beginning of an intensely interesting series of articles on a new method of identifying minerals, in which the minerals are polished and etched with acids. While the idea is not original, nevertheless Dr. Dake will present a number of new features, and his methods are so simple that the amateur collector can easily follow them.—The Editor.

The purpose of this series of articles is to call to the attention of the collector and student of minerals, a method whereby one may identify most of the metallic minerals in a scientific way. Many of the metallic minerals, especially when not crystallized, resemble one another very closely in a physical way making determination difficult by ordinary means. The micro-chemical method offers a quick and relatively positive means of identifying most of the metallic and semi-metallic minerals. A small fragment, which will yield when cut and polished a surface one-half inch square, is sufficiently large. A book by Davy and Farnham, "Microscopic Examination of the Ore Minerals" is the standard text used in this study.

A small amount of equipment is needed and for the beginner the writer recommends the following:

(1) A Lietz binocular magnifier, with a magnification of 45x. This instrument, in addition to being used in the examination of the polished surface, is also invaluable to the student of mineralogy for the study of any mineral or ore specimen in the rough. The minute crystals and disseminations can often be readily determined with the aid of this magnifier. It can also be used to study crystallography and is excellent to examine the "cork mounts." The chief advantages of the binocular over the ordinary microscope are, the longer working range and a three dimension field of view. This is undoubtedly one of the most useful instruments which the mineral collector can possess.

(2) An electric motor to cut and polish the specimens. A small size of one-quarter or one-fifth horse power will suffice. A speed of about 1,700 revolutions per minute is desirable as the higher speeds tend to throw off the abrasives and water.

(3) The reagents used most frequently are as follows:

Nitric acid, one part concentrated and one part water.

Hydrochloric acid, one part concentrated and one part water.

Potassium cyanide, a twenty per cent solution in water.

Ferric chloride, a twenty per cent solution in water.

Mercuric chloride, a saturated solution in water.

Potassium hydroxide, a saturated solution in water.

A one ounce solution of each of these reagents is sufficient for many tests as only a minute portion is used at a test. To apply the reagents to the polished surface one can use a glass tube with a diameter of about one-eighth inch, of which one end has been heated and drawn out to a capillary opening and broken off at a convenient length. One of the applicators are used for each solution and are used by dipping the fine end into the solution and touched to the polished surface while under observation with the magnifier. Keep the reagents in glass stoppered bottles to avoid evaporation and contamination.

(4) The grinding and polishing laps are of many different kinds. The system described by Davy and Farnham is

excellent where one desires a surface with a maximum of perfection. This method, however, requires a more elaborate polishing outfit and takes more time. For all ordinary purposes the writer has found the following method to be satisfactory.

(a) First obtain a flat surface on the specimen by the use of a medium grit carborundum wheel. A wheel with a thickness of about one inch and a diameter of four or five inches is large enough. The edge of the wheel is first used to obtain an approximately flat surface and the final flattening is done on the side of the wheel. Keep the wheel charged with a small stream of water to avoid heating unduly and to facilitate grinding.

(b) The next step is to eliminate the deep scratches and pits left by the carborundum. This can be done with a wooden wheel of about the same size as the carborundum, and covered on one side with a light canvas or chamois skin, and mounted on the shaft of the motor same as the carborundum. The canvas or chamois can be tacked on to one side of the wheel to hold it stretched tight. A No. 3 optical emery made into a thin paste with water and glycerine, is the abrasive used on this wheel and can be applied while the wheel is in motion by frequently dipping the face of the specimen into the paste. It is also best to keep the cloth wet while in use by allowing water to drip upon it. No. 3 emery (optical) is a very fine grade of emery and will remove practically all the scratches left by the carborundum. This material works quite rapidly with the softer minerals but when the specimen consists largely of minerals of a hardness of quartz and pyrite a longer time will be required to take out the deeper scratches. This part of the preparation takes the longest time, and will require from two to ten minutes, depending upon the hardness of the mineral and the kind of surface desired.

(c) The final step is the burnishing of the specimen. This is done with a wooden wheel covered with a soft cloth and charged with a thin paste of whiting and water. A few seconds will be sufficient for the burnishing operation. The tin oxide powder (rouge) used by jewelers can also be used, but the rouge is difficult to wash off afterwards while the whiting can be readily removed.

The specimen should be washed before passing from one abrasive to another and separate wheels should be used for each abrasive. A little practice will enable one to prepare specimens quite rapidly. The work can be speeded by preparing a number of specimens at a time, and going through each operation with all the specimens before passing to the next.

After the surface is properly prepared the specimen can be mounted in a number of different ways. Clay, beeswax, or a dish of bird shot can be used for temporary mounts. For permanent mounts the writer has found Kerr's Impression Compound to be ideal. This material is superior to sealing wax, being much less brittle, can be readily softened with hot water, and can be manipulated better. In mounting a specimen for examination by vertical illumination it is essential that the polished surface be horizontal and at right angles to the microscope lens. With the binocular magnifier oblique illumination is used and the specimen need not be accurately mounted.

As a source of light for oblique illumination, daylight or an ordinary shaded desk light can be used. These sources of light strike the polished surface at an oblique angle and is then reflected upward into the lens. With oblique illumination, better results can often be had by tipping the specimen at a slight angle toward the light in order to get the maximum reflection from the polished surface, and to best bring out the natural colors. For this purpose a small wooden wedge slipped under the mounted specimen will enable one to readily orient it. Some of the advantages of oblique illumination are mentioned in the September, 1924, issue of *The American Mineralogist*. In the use of vertical illumination, the surface of the specimen must rest in a horizontal plane, and a special and more costly type of microscope must be used.

Many of the determinative methods used in mineralogy require the use of costly scientific instruments and a scientific technical knowledge, but with this method the "amateur" can make accurate determinations in the metallic mineral species.

By the use of the method outlined above the following properties of a mineral or ore can be readily and accurately determined.

(a) Hardness and color.

(b) Color of streak powder.

(c) Color of the internal reflection in the case of semi-opaque minerals.

(d) Qualitative tests for the elements present in a mineral.

(e) Approximate percentage of each mineral present in a mixture or an ore.

(f) Genesis of the minerals in an ore.

(g) Reactions with the various reagents to help determine identity.

(h) Crystal outline if any.

(To be continued.)

THE SLUICE BOX

By A. Riffle

"Old Bill' can pass eighty years in review before his memory and fifty of them wear the colorful uniform of the days of "pick and shovel and pan" of tunnel and stope and winze. From the eminence of these heaped up years "Old Bill' looks out upon the rest of us with mingled thoughts. Sometimes these thoughts find expression in words that are cynical and full of criticism or sarcasm but generally they are kindly, humorous, tolerant, and wise. I cannot help but wonder what my old friend was thinking about the other day. Was he in one of those "It might have been" moods thinking of far more pleasanter things that life might have held out for him if he had not spent his best years among gravel and hard rock, in isolated places, in his life time's search for the precious metals? He was sitting on a bench outside the gas filling station and an obviously Eastern "Schoolma'am," genuinely thrilled with her first personal meeting with a real Western prospector, was holding him in curious conversation. "And what is the difference between fool's gold and real gold?" I heard her ask. "Old Bill' replied, "Ma'am, there ain't any difference, it's all FOOL'S gold."

A mineral separated from its label sometimes becomes a specimen of doubtful value. The mineral itself should be numbered as well as its label and then in case of separation or a mixup it can be easily identified. I have found alumnum bronze paint to be the mest material for marking specimens. I apply it with a very fine brush. It shows up as well on light as on dark colored specimens and it does not wear off, fade, or undergo any change as far as I have observed. Sometimes groups of very fine crystals or rough and fragile specimens present no surface on which a number can be painted. In such cases I mix a small quantity of plaster of paris and water and apply this to some inconspicuous place on the specimen in such a manner that it will form a small flat surface on which to paint the number.

Don't spend all your money for gas this summer. Save some of it to help Rocks and Minerals along with subscriptions and advertisements. Also set aside a generous amount for specimens for study and display next winter.

The automobile and the tourists are with us again and "Old Bill' has retired to his summer home. He doesn't take very kindly to too many autos and curious "Wimmin in pants," so each summer he moves up to his prospect cabin in an almost inaccessible place in the hills. Here he will spend his time fishing, doing some assessment work and maybe helping nature take her course with a keg full of choke cherries and will come back again to the village in the fall ready for another long winter.

I have been telling you in former issues of Rocks and Minerals what a splendid magazine the Editor is giving us but the last issue leaves me short of words for proper, commendatory description. I can only say that if the dealers and collectors will do their part as well as the Editor is doing his we will soon have the best hobby magazine in the country.

A MICROSCOPIC MINERAL COLLECTION

By C. L. CLINTON
712 South Avenue, Westfield, N. J.

Everyone has his own idea for the size and arrangement of a mineral collection. Whether you prefer small, composite or massive specimens, is merely a matter of choice and the amount of space available.

My hobby is a microscopic collection. I have not the space to devote to a collection of larger specimens and this method also allows me a larger collection for a given amount of expenditure.

At present I collect semi-precious gems and gem material. These I display in test-tubes arranged in a four-tier rack.

For anyone interested here are a few simple directions how to make a rack and display the minerals:

Procure some ¼ inch box wood. From this cut 8 strips 1½ x 25 inches. Plane on all sides and drill 9/16 inch holes one inch apart. Glue each pair of these strips to the tops and bottoms of end pieces 1¼ inches high x 1½inches wide. Glue a piece of heavy cardboard to the underside of the bottom strip to prevent the test-tubes from passing through. Each of these four pairs glue to two triangular end pieces with a straight bottom 8 inches long and straight back 12 inches high and sloping from back to front. Now glue these racks to the end pieces starting from front, bottom. These racks should be spaced ½ inch apart and set back far enough to clear each other. The finished job can now be shellaced or stained to give it a better appearance. It will now accommodate 8 dozen test-tubes. These I buy from a local laboratory supply house for 27 cents per dozen with corks.

Now take your specimens and drop one in each tube, poking strips of cotton into it with a lead pencil until when putting in the cork the tube is packed solidly enough to hold the mineral against the rounded top of the glass. For very small specimens, work in about ½ inch of cotton first, then slip in the mineral between the cotton and the glass, pushing it up into place. This will prevent the stone from reaching the extreme top of the tube thus locating it in a more showy position. This is particularly suitable for cut gems.

I arrange my collection according to the chemical composition of the specimen, using Dana's system of numbering. I typewrite labels and shellac them to the tubes (this is the only adhesive that will stick to glass) one inch down from the top. Following is a sample of the labelling:

426
TOURMALINE
Var.
Rubellite

Anhydrous
Silicate

Minas Geraes
Brazil

The racks being placed above and behind each other, you will find that the front rows do not obstruct the labels of the ones behind it; thus the descriptions may be read without disturbing any of the tubes.

For further reference to any specimen in the rack, I look it up in Butler's Handbook of Minerals—where the numbers are arranged in numerical order.

The most noted deposits of tungsten are in China, in fact China controls the world's supply of this metal. Details concerning the deposits are lacking as no trained geologist is known to have examined them but it is assumed that they are in the Province of Kiangsi and probably in the Shai Wai Shan and Yun Yun Shan districts, both of which are close to Nan-an-fu.

Carnotite (an important ore of uranium and vanadium) is found coating Pottsville Conglomerate at Mauch Chunk, Pa. The mineral was discovered some years ago in blasting out a rock cut for a trolley line. The deposit was never prospected though many geologists have examined the exposures. Some of the specimens are very attractive.

PHOSPHORESCENCE OF MINERALS

By E. MITCHELL GUNNELL

This is a continuation of a series of articles on the intensely interesting phenomena of "cold light." It would please us to have our readers perform some of the experiments outlined in these articles. Those desiring further information are invited to correspond with Mr. Gunnell, who will be only too glad to answer questions. His address is: E. Mitchell Gunnell, 595 E. Losey Street, Galesburg, Ill.

Part 3—Being a Discussion of Tribo-luminescence in Minerals

While certain luminescent phenomena (as thermo-luminescence, for example) is to be studied only under unsatisfactory or perhaps, slightly dangerous conditions, triboluminescence is extremely simple and safe to exhibit. Only three things are essential; a sensitive specimen, a pen-knife, and a dark room. Other methods for showing the property, besides scratching a specimen in a dark place, may be devised but for the average experimenter this way is practical and efficient.

For those mineral collectors not yet familiar with the wonders of inorganic luminescence, I would say that triboluminescence, is phosphorescence excited by friction. Triboluminescent minerals are those, then, which give off sparks or flashes of light when subjected to one or another form of mechanical friction, such as scratching, breaking, tearing, or crushing. The kind of friction to be used depends upon the mineral one is testing. Thus, granular sphalerite exhibits triboluminescence best when scratched with some hard object; pectolite, when a glassy, needle-like crystal is broken in two; muscovite mica, when a sheet is split off, or when crushed in the hand; dolomite, when struck a sharp blow with a hammer.

Certain scientists have held that triboluminescence is really a type of chemiluminescence, that is, that the light emitted upon scratching, say granular sphalerite, really results from a chemical change caused by the friction. But most researchers firmly believe that the light has a purely physical origin. In some manner or other, friction causes a rearrangement within the atoms of these minerals and it is this change which causes the sparks of light. An interesting thing to note here which may or may not be evidence for a physical cause of triboluminescence rather than a chemical one is, that sensitive specimens will exhibit the phenomena as well under water as out of it. This fact certainly proves that water will neither prevent nor extinguish the luminescence. Mr. W. S. Andrews, of the General Electric Company, first called attention to this fact I believe. If the now generally accepted Bohr atomic theory is correct, then with triboluminescent minerals friction brings about the same rearrangement of electrons in the atom as does heat with thermoluminescent minerals, and the invisible utra-violet rays with electroluminescent minerals. In other words, it is highly probable that the original atomic structure of a triboluminescent mineral is similar to that of, say, a thermoluminescent mineral or an electroluminescent mineral and that in either case the excitant results in an emission of light caused by the same physical change. If this were the case then we might reasonably expect to find a luminescent mineral sensitive to more than one kind of excitant. For instance, we might expect to find that a triboluminescent mineral is thermoluminescent or even electroluminescent. Such a plurality of sensitivity is often actually the case. Derbyshire fluorite is perhaps the outstanding example—the green cubical crystals are brilliantly fluorescent in bright sunlight; they phosphoresce after being heated, scratched, or exposed to ultraviolet or X-rays. Pectolite is triboluminescent, photoluminescent, and fluores-

cent under the ultra-violet rays. Many minerals are both thermo- and triboluminescent; among these are albite, wollastonite, orthoclase and spodumene. Willemite from Franklin, N. J., is fluorescent, tribo-, electro-, and photoluminescent.

A list of triboluminescent minerals is now in order. As was the case with thermoluminescent minerals, by no means are all specimens of a given species sensitive. A certain locality affords phosphorescent material, while that from all other places give negative results. While individual specimens of many minerals have been found to be triboluminescent, yet only a comparatively few species exhibit the phenomena to a marked degree. These minerals are quite easily procurable to the amateur collector and experimenter; most dealers being able to furnish them. If you have any difficulty getting sensitive specimens, write to me and I'll tell you where to send for them. A list of the principle triboluminescent minerals are given at the end of this article.

Individual specimens of the following minerals have also afforded a more or less marked display of triboluminescence; barite, calcite, corundum, orthoclase, apatite, spinel ruby, spodumene, leucophanite, tremolite, and wurtzite. I recommend that the experimenter test the specimens of these minerals that he may own in the hope that he might run across a real sensitive piece from some unrecorded locality. But be careful you don't scratch and ruin some fine but soft crystals in your search for triboluminescent minerals. The truth is that massive, granular, and cleaved pieces afford better chances for success than do crystals, so you better confine yourself to the former varieties.

As already stated, while scratching a sensitive specimen with a pen-knife is a simple and adequate method for exciting triboluminescence, there are other and more efficient ways for testing minerals. One novel method, the suggestion of which I am indebted to Mr. W. L. Lemcke, of Franklin, Pa., is as follows: powder a piece of a sensitive mineral by crushing it very fine with a hammer. Collect the powder and sift it *evenly* over a circular piece of cardboard 2 inches in diameter (the cardboard having been *previously* coated with a thin layer of *wet* glue). Now cut out of a one-half inch board a circular piece of wood 2 inches in diameter, and driving a nail through the center of this, fasten it to a rounded handle. The powdered mineral now being securely dried to the piece of cardboard, take this cardboard and glue the back side of it to the circular piece of wood. Next procure a piece of one-eighth inch thick ground glass 5 inches square. Place adhesive tape around the sharp edges of the glass so as to overlap the sides about a one-half inch; otherwise you might receive a bad cut. Now go into a dark room and holding the square glass securely in the left hand, with the rough side towards the floor, press the mineralized surface of the prepared mineral, (held in the right hand), to the rough glass, and rapidly rotate the wooden handle. A marked display of triboluminescent light should be visible, the brilliance of which depends on the mineral used. By making mineralized discs from all of your sensitive material you will be able to produce a much more brilliant glow or display of sparks than would be possible by merely scratching a specimen with a pen-knife or nail. While other methods may easily be devised I doubt whether any will be simpler or more efficient than the one just mentioned. The reason for using powder rather than a piece of the mineral itself is necessary on account of the hardness of most of the minerals. However, the triboluminescent sphalerite from Mariposa County, Calif., is soft enough to use en masse; and the Beaver County, Utah Sphalerite, is so sensitive to friction that by merely touching it to the glass a brilliant display of sparks will be caused. In his laboratory experiments on "Photographic Spectra of Triboluminescence" conducted at the Indiana University in 1925, (1) Dr. D. M. Nelson used a much more elaborate apparatus. Testing sphalerite and fluorite for triboluminescence, the native ore was fashioned into the shape of a grindstone; this was by means of a rod passing through the center of the ore and fitted to the sleeve of an upright motor—and a wire or carborundum brush being used as the excitant. By this means Dr. Nelson obtained such a brilliant discharge that a photo-spectrum of the sphalerite was taken an inch away from the brush, a feat deemed impossible by earlier experimenters.

A number of chemicals, organic and inorganic, show triboluminescence. Take two lumps of sugar and rub them together in the dark and a very noticeable whitish glow will be visible. Saccharine, the coal-tar substitute for sugar used by

diabetics, is also sensitive to friction in this way. Uranium nitrate crystals sparkle when shaken in a dry bottle. Quinine sulphate and salophen, two common medicines, glow when rubbed between glass surfaces. The best method for preserving these powders is to keep some of each in a separate, shallow, wide-mouthed bottle. When you desire to excite them to phosphoresce, uncork and run a glass stirring rod up and down the inside of the bottle. A trail of white light will result from each movement of the rod. But the most sensitive of triboluminescent chemicals is artificially prepared zinc sulphide. There are two grades of this phosphor manufactured. The commoner kind is commercially known as "phosphorescent zinc sulphide." This material is a light-green powder, highly photoluminescent, and is the principal ingredient of the "radium luminous compound" used in making watch dials visible at night. The other grade is sold under the name of "triboluminescent zinc sulphide." This is an orange powder that is both extremely triboluminescent and photoluminescent. Both of these sulphides are sensitive to friction, the first quite so and the latter extremely so. They are manufactured and sold by the Hammer Radium Company of Denver, Colo. Mr. W. S. Andrews of the General Electric Company, while experimenting with laboratory manufactured phosphorescent materials, prepared a highly triboluminescent zinc sulphide. The formula he used is printed in his excellent article that appeared in *The American Mineralogist* for February, 1922.

I would be only too glad to hear from any experimenters who have run across any new triboluminescent minerals in their collections. There is no reason for believing that all the sensitive species have been recorded. New minerals are being discovered all the time and new deposits of the old species are being located and developed. Such a continuous influx of new material should certainly offer chances of success to the searcher after sensitive specimens.

PRINCIPAL TRIBOLUMINESCENT MINERALS

Name of Mineral, Color of Luminosity and Locality

Albite—White—New England, Virginia, etc.

Dolomite—Reddish!—Wasatch Mountains, Utah; California, etc.

Fluorite, green — White — Connecticut, New York, New Hampshire, etc.

Hexagonite — Reddish or golden — Northern New York.

Muscovite—White!—Any locality.

Oligoclase—White! — Mitchell County, N. C.

Pectolite — Yellow!! — Northern New Jersey.

Quartz—Yellow—All localities.

Sphalerite, var. Cleiophane—Golden!!! —Franklin, N. J.

Sphalerite, fine grained granular — Golden!!! — Horn Silver Mine, Beaver County, Utah; Mariposa County, Calif.

Talc — Yellow — Gillespie County, Texas.

Willemite, white fibrous — Yellow or greenish!—Franklin, N. J.

Wollastonite—White! — Llano County, Texas; California, New York

(1) Printed in the Journal of the Optical Society of America and Review of Scientific Instruments, March, 1926.

A MINERAL STUDY PROJECT

By Mrs. Herbert E. Ives
Upper Montclair, N. J.

In March, 1927, the American Association of University Women, the one nation-wide organization of women college graduates, formed its state division in New Jersey, with Mrs. Charles MacFarland of Mountain Lakes, as President. In November, Mrs. MacFarland authorized the formation of a Committee on Libraries, Stories, Museums, and Young People, of which Mrs. Joseph L. White of Upper Montclair, is Chairman.

One local need which seemed to this committee perhaps symptomatic, was for more adults in the community who knew definitely about some one or other field of natural science, or at least enough to help with young people's group—as scout examiners, givers of talks or short courses in schools or group, or as helpers on nature hikes, as well as in the home.

Since northern New Jersey is so rich in minerals of variety and interest, the

possibility of a mineral study course was broached to Boy and Girl Scout and Camp Fire Girls officials, and this course was offered in January at their request.

Cooperation was instant and continuous. The Montclair Art Museum opened its doors for eight morning meetings and put two cases of unusual minerals at the disposal of the class while Boy Scout headquarters sent a series of typical minerals for handling and study. The Public Library sent an exhibit of books on geology and mineralogy; prepared a reading list for publication in the local weekly; purchased several new works on these subjects; and planned a window display (especially suitable for a jeweler's window) of striking mineral specimens and attractive books.

The *Montclair Times*, our local weekly, gave space to advance notices of the course and a half-column resume of each meeting with a list of prominent people who were members of committees, gave lectures, or were otherwise associated with the course. The Editor was even moved toward the end of the course to write an editorial commending such a valuable and interesting hobby as the study of minerals.

Arranging the course fell under two heads: securing the students and securing the speakers. At first two classes were projected: one for adults and the other for boys and girls of high school age. But it was finally decided to offer the course for adults only.

To prove that such a course does not need speakers that are high-priced nor from afar but that it can be arranged wherever a community feels the urge and takes the initiative, two of the committee themselves volunteered to work up and give two introductory talks. Other speakers for special topics were secured from a normal school, from the Newark Museum, and from the Paterson Museum. Each speaker expressed himself or herself as cordially in sympathy with the purpose of the class and each generously came without charge.

After the course was planned it was a question if anyone would elect it but thanks to the recommendation of the Scouts and Camp Fire officials and to the newspapers' announcements, 33 paid the registration fee of $1—5 men and 28 women. Later half a dozen more enrolled. The average attendance for the first four meetings was 28, at the seventh, 21.

Dr. Herbert P. Whitlock, Curator of Minerals at the American Museum of Natural History in New York City, invited the class to a personally conducted tour of the J. P. Morgan Collection of gems and minerals on exhibition at the Museum and one of the five finest collections in the world. Here the class went for its eighth meeting.

It was recommended that each member of the class make a personal collection of minerals, study a neighboring quarry where some excellent minerals could be obtained, and visit at least one museum. Before the course closed, over half in the class owned Loomis's "Field Book of Common Rocks and Minerals" and a number were in possession of copies of Whitlock's "Story of the Minerals."

The method of the course was varied and included lectures, special topics, reading maps, and the actual handling of minerals. The first meeting opened with the examination of a dozen minerals from the Boy Scout Collection. These were new, both in name and appearance, to most in the class but before many meetings became old friends—chalk, flint, rock salt, fluorite in two colors, malachite, azurite, etc. This was followed by a talk on—What Is a Mineral?

Later subjects included—How Minerals Are Formed; Crystal Growth; Water as a Maker of Minerals; Petrified Wood; Stalactites and Stalagmites; Geodes; Simple Minerals (those found in the native state as well as the useful ores); Crystallization or Nature's Mathematics; Minerals that Form Rocks; etc. Two talks of special interest and value were also given—The Minerals of Our State and the Geology of our State.

So much interest was manifested that the minimum of six meetings was extended to nine and two additional field trips were also arranged.

The course would have been given if but two students were obtained. The fact that more were interested and came so faithfully to the classes seems to indicate that there is a keen desire on the part of the general public to know something about the fascinating study of minerals. It is planned to hold a similar course next year.

"You can't think what this course has meant to me!" is a frequent comment, and "It's what I've always wanted but didn't know how to get!"

A COMPILATION OF GEM NAMES

By GILBERT HART

P. O. Box 2005, Birmingham, Ala.

Mr. Hart and Rocks and Minerals will be glad to have readers send in additional gem stone names not here included or suggestions as to any corrections in names which they believe should be made.

This is a continuation of the very interesting compilation of gem names (the largest ever printed) made by Mr. Hart, the first installment of which appeared in the December, 1927, issue of the magazine. This list will be continued until completed.—The Editor.

Cabochon—a rounded cut with no facets, or a gem so cut of any type.

Cacholong—opal, milky white, opaque, porcelain-like.

Cacholong Opal—opal, common opal, feebly translucent.

Caesium Beryl—beryl, contains several per cent of caesium, colorless to pink.

Cairngorm—quartz, yellow to smoky brown, also gray or black, a favorite Scotch stone, sherry yellow is most prized color.

Cairngorm Stone—quartz, smoky yellow to smoky brown, often transparent.

Cairngorum—local Scotch spelling of cairngorm.

Calaite—turquoise.

Calamite—orthorhombic, usually massive, white to green, hardness 4.5 to 5, specific gravity 3.45; a hydrous silicate of zinc; see Hemimorphite for notes concerning names.

Calamite—tremolite, asparagus green.

Calcite—hexagonal, usually rhombohedral or massive, pale colors or white; hardness 3, specific gravity 2.72; calcium carbonate; varieties used as gems or ornamental stones: **Agrite, Alabaster Stone, Argentine, Calcomalachite, Calc-sinter, Calc-tufa, Egyptian Alabaster, Fire Marble, Gibraltar Stone, Iceland Spar, Lumachelle, Marble, Nail-head Spar, Onyx Marble, Oolite. Pisolite, Ruin Marble, Satin Spar, Stalactite, Stalagmite, Travertine, Verd Antique.**

Calcomalachite—mixture of calcite and malachite, from Arizona.

Calc Sinter—calcareous deposit from hot springs, mainly calcite.

Calc Tufa—calcite, travertine.

California Cat's Eye—serpentine, compact fibrous, chatoyant, from Tulare County, California.

California Iris—spodumene, kunzite.

California Jade — vesuvianite, californite.

California Moonstone — chalcedony, white or gray.

California Onyx — aragonite, dark brown.

California Ruby—pyrope.

California Tiger Eye—serpentine, compact fibrous, chatoyant.

Californite—vesuvianite, compact, translucent, green.

Callainite—variscite, green and translucent.

Camby Stone—quartz, carnelian, from Cambay, India.

Cameo—relief carving on a gem, especially on onyx, cutting through one layer to expose a differently colored lower layer of onyx.

Canaanite—diopside, grayish to bluish.

Canary—diamond, yellow.

Canary Beryl—beryl, greenish yellow.

Canary Stone—quartz, yellow carnelian.

Cancrinite — hexagonal, usually massive, colorless to pale yellow, hardness 5 to 6, specific gravity 2.45; hydrous silicate of sodium and aluminum, with carbonate.

Candle Coal—cannel coal.

Cannel Coal—coal, grayish to brownish black.

Cape — used in reference to several gems from South Africa, which leave for Europe from Cape Town.

Cape Chrysolite—prehnite, green, from South Africa.

Cape Diamond—diamond, yellow tinge.

Cape Garnet—almandite, bright reddish yellow.

Cape May Diamond — quartz, rock crystal from Cape May, N. J.

Cape Ruby—pyrope, blood red, from South Africa.

Cape—diamond with yellowish tinge.

Carbonado—diamond, black, probably cryptocrystalline.

Carbuncle—almandite, clear deep red; (2) any red, crimson or scarlet garnet, or any other type of red stone when cut cabochon, hence refers to color and cut.

Carmazul — oxidized copper ore, varicolored, mixture of jasper, quartz, chalcedony, hematite, chrysocolla, malachite; from Lower California.

Carnelian—chalcedony, red and translucent.

Carnelian Agate — chalcedony, agate with bands of red carnelian.

Carnelian Onyx — agate, alternating bands of white chalcedony and red carnelian.

Carphostilbite — thomsonite, straw-yellow, from Iceland.

Cassidoine—quartz, old English name for chalcedony.

Cassinite—feldspar, aventurine, pearly, bluish green.

Cassiterite — tetragonal, massive or prismatic, usually black, also white to pink; hardness 6.5, specific gravity 7.00; tin dioxide, also called **Ruby Tin**, **Toad's Eye Tin**, **Wood Tin**.

Catalinite—quartz, beach pebbles from Santa Catalina Islands, California.

Catalina Sardonyx—quartz, catalinite.

Catlinite—compact red clay, also called pipe stone from its use by the Indians.

Cat Sapphire—corundum, dark blue.

Cat's Eye—applied to many minerals which have fibrous structure, or inclusions of fibrous minerals which yield a changeable luster of opalescence without play of colors. By some limited to chatoyant chrysoberyl, but used generally by the jewelry trade in reference to the following, when chatoyant — quartz, beryl, hypersthene, enstatite, bronzite, aragonite, gysum, labradorite, limonite, hematite, serpentine.

Cat's Quartz—quartz, cat's eye.

Cavernous Quartz—quartz, rock crystal variety with deep cavities parallel to the faces.

Cawk—barite.

Celestial Precious Stone—olivene, especially that taken from meteorites.

Celestial Stone—turquoise.

Cer-Agate—agate, chrome yellow, from Brazil.

"Ceylon" — prefix applied to various stones in reference to the possible origin in Ceylon, a famous Oriental gem country.

Ceylon Cat's Eye — chrysoberyl, cat's eye variety.

Ceylon Chrysolite—tourmaline, greenish yellow.

Ceylon Hyacinth—garnet, grossularite.

Ceylon Opal—feldspar, moonstone.

Ceylon Peridot — tourmaline, honey-yellow to yellowish-green.

Ceylon Ruby — corundum, ruby from Ceylon; (2) almandine, deep red, from Ceylon; (3) any pale or pink ruby.

Ceylon Sapphire—corundum, pale blue.

Ceylonese Zircon — zircon, fire-red, often cloudy.

Ceylonite—spinel, black to dark green or brown.

Chalcedony—compact cryptocrystalline silica, usually referred to a variety of quartz, but may differ in optical properties; translucent to transparent, luster waxy. The following varieties have been named: **Basanite, Blood Jasper, Blood Stone, Blue Chrysoprase, Blue Moon Stone, California Moonstone, Cambay Stone, Canary Stone, Carnelian, Cassidoine, Chert, Chrysoprase, Cloudy Chalcedony, Cornelian, Creolite, Egyptian Jasper, Egyptian Pebble, Emeraldine, Enhydros, Ephialtes Stone, Ezteri, Flint, Frost Stone, Flower Stone, Hagstone Helictrope, Holy Stone, Hornstone, Hyaline Quartz, Iolanthite, Jasper, Jasperine, Jasperized Wood, Keystoneite, Kinradite, Lydian Stone, Lydite, Mohave Moonstone, Morion, Moonstone, Morlop, Mother-of-Emerald, Mother Stone, Night Mare Stone, Novaculite, Occidental Chalcedony, Oriental Chalcedony, Oriental Jasper, Ouachita Stone, Plasma, Prase, Prismatic Moonstone, Sandy Sard, Sard, Sardine, Sardine Stone, Sardoine, St. Stephen's Stone, Sycite, Teststone, Touchstone, Violite, Water Agate, Water Stone, White Agate, White Carnelian, Witch Riding Stone, Zafirina, Zonite.**

Chalcedony Onyx — agate, white and pale bands.

Chalcedonyx — chalcedony with alternating stripes of gray and white.

THE GEM DEPARTMENT

Conducted by
GILBERT HART

Each issue Mr. Hart will give in this department information concerning gems and gem minerals. As Mr. Hart invites correspondence relating to the department, letters should be addressed to him as follows:

Gilbert Hart, P. O. Box 2005, Birmingham, Ala.

Many of the precious gem minerals are very brittle; and so will not stand up under the hard service of continued wear. Wearing of several rings on one finger, with one of the stones harder than the other, will often result in the abrasion of the softer, either by direct scratches or by a dulling of the polish through innumerable small scratches. Then too, small jars and knocks will cause the brittle stone to chip at the girdle, leaving jagged edges and greatly lessening the beauty of the stone. Emerald is peculiarly noted for the liability to chip. Topaz will cleave parallel to the base of the crystal, and a drop on the floor will sometimes split it. Opal is also liable to splitting, apparently through a lack of cohesion in the various layers of which it is made. Kunzite and other spodumene gems have a well-defined cleavage like topaz, and must be handled with care. Tourmaline is also rather easily chipped. Gems of the hardness of quartz or less are subjected to dulling of their polish by the action of the dusts of the air. Much of these fine particles of dust are quartz, and usually the corners of these particles are sharp and keen. They soon cause amethysts to lose their luster, which can be regained only by a further polishing which decreases the weight and value of the gem.

We usually think of gems as transparent and highly lustrous stones which shine brightly with rainbow colors. Yet for show of peculiar colors or structures many opaque minerals are mounted for use as jewelry. Most of us have seen a cravat pin whose "stone" was a small gold nugget. These were more common in the days of the Klondike than now. In the Antipodes a favorite stone was a valuable bit of iridosmine mounted as found by the miner with either the facets of the natural crystal or the sanded-appearing exterior of the placer nugget. Native platinum has rarely found its place as a gem. Hardly "gems" but of similar use and meaning are the masses of native copper used by the women of various aboriginal tribes of Africa for ornamentation.

Emerald is a variety of beryl, which is unusually clear and of a delicate "emerald-green" color. A close kin is the aquamarine, which is the same mineral species, whose color is more of the tone of sea-green. Morganite is a pinkish beryl, and several other types of colored beryls are often used as gems. The usual beryl is a greenish or yellowish material, found almost exclusively in pegmatite dikes, in opaque masses which are not suited for cutting. The most famous emeralds are found in lenses of pegmatitic material in Colombia, surrounded by limestone. Emeralds are also found in considerable number in the pegmatite bodies of the Urals. A few beryls of gem grade have come from Maine, but most of these are of the aquamarine or morganite variety. Similarly gem beryls are known from many other places where pegmatites are found, and a development of clear crystals was possible.

Gems and ornamental stones must have beauty as a prime requisite. A dividing line between the two types is often made according to use, "gems" being regarded as stones used after superficial preparation for the personal adornment of mankind and "ornamentals" those used for the decoration of his buildings, vehicles, furniture, etc. In such a distinction, the rubies, sapphires and diamonds used in enlivening the Indian Temples would be mere ornamentals, but would be elevated to the most precious class of gems as soon as some impoverished European

could smuggle them into his native land.

Truly it would seem that the distinction is more theoretical than practical, and that the class of "gems" can be enriched by any whim of society to include individuals of any mineral species which possess the proper ideals of beauty. Thus; malachite when attractively mixed with azurite is mounted for use as brooches or scarf-pins; yet it has none of the recognized qualities of a gem, hardness, rarity, durability or brilliance but gains its use only through the unusual color combinations.

Although durability is an important property of the precious gems, in the class of semi-precious stones durability and the associated hardness is often a fault. Many of these gems are obtained for a single occasion, and softer material easily shaped and polished with the requisite beauty of color and form can be obtained in a manner much like ordering a new gown. These minerals, too, offer many shades of color not found in the precious stones as well as unusual combinations and rare structures.

Thus the number of mineral species used for personal adornment is growing, and the jeweler who would identify an unusual colored stone must be prepared for all the common tests and perhaps for many new ones. With the ever-increasing use of jewelry we find lapidaries in many new places, not confined to certain well-established centers as the Bavarian agate district and the Antwerp diamond cutters. These scattered craftsmen are ever on the lookout for additional material to shape and polish in attractive ways; and naturally the local deposits of various types are given unusual chances to show their worth. We find that the modern cabachon stones are of all types of minerals, usually those possessing hardness equal to quartz are preferred, but often any kind with suitable colors is made up into an attractive shape. Even the harder rock types, rhyolites, felsites, glassy obsidians, and occasionally such heterogeneous rocks as granite or porphyry are so cut as to reveal their peculiar beauties of structure.

In short, the identification of modern jewelry is really the identification of an unknown mineral or rock, with the added trouble of limiting tests to non-destructive methods. The older tables of properties of gem minerals become obsolete with the addition of new types, and we find absolutely necessary the use of dichroscope, refractometer, and such optical devices.

SOME FAMOUS DIAMONDS

The Cullinan is the largest diamond on record, weighing some 3106 carats as found. The stone was a cleavage fragment, suggesting that it was part of one enormous stone; but the other part from which it was cleaved has not yet been discovered. It was found at the Premier Mine in the Transvaal in 1905. From it several gems have been cut, the four largest of which weigh 516½, 309, 92, and 62 carats. Many smaller stones were cut from it.

Next to the Cullinan in size is the Excelsior, which weighed 970 when found at Jagersfontein, Orange River Colony, Africa, in 1893. It also was cut in many small stones, the largest of which is 67 carats.

Perhaps the most famous diamond is the Kohinoor, a stone of purest water weighing only 106 carats. Legend traces its history for some 4000 years to the earliest tradition. The first definite record is in 1304, and it has taken an important part in Indian history since then. It was brought to England during the last century and became one of the Crown Jewels. It was recut at this time so that all its beauty could be shown in the best modern cut.

The Great Mogul is the largest recorded Indian stone. It was discovered in 1650 at Kollur, where it was seen by that famous French traveler, Tavernier. Since that date it has completely dropped out of the sight of civilization; although there is a recent report that it was among the Russian Royal Jewels seized by the Bolsheviks.

Another large Indian stone is the Orloff, which was stolen from an Indian temple by some daring European, and sold to the Russian Government which added it to the Crown Jewels. It has not been seen since the revolution of 1917.

The largest diamond from Brazil is the Star of the South, a 254 carat stone from Bagagem, found in 1853. It has been cut to a brilliant of 125 carats.

The Dresden is a flawless apple-green diamond of the purest water, now in the possession of the Saxon Royal Family. It weighs only 40 carats, but is the most perfect green diamond known.

Another colored stone is the deep blue Hope diamond of 44 carats. It was found in India, and has the unusual reputation of carrying with it all sorts of ill-luck.

Perhaps the largest yellow stone is the Tuscany or Florentine, which is a stone of 133 carats tinged with yellow. It is also called the Austrian Yellow diamond.

The Tiffany is a brilliant orange-yellow stone weighing 128 carats, now in the collection of Tiffany. It was found at Kimberley.

JUNIOR MINERALOGISTS

The following notice of the "Goofy Gang" has come to the Editorial desk. The boys of this club belong to the Junior Chapter of Mineralogists at the Academy of Natural Science in Philadelphia, Pa., which meets every first Thursday of the month. But these meetings are not frequent enough for these peppy youngsters, so the Goofy Club was formed. The club meets every two weeks at the home of a member and the notice indicates that they are thoroughly interested in mineralogy.

These boys are getting something of value out of life. Boys in other high schools would find such clubs of infinite interest and value.—THE EDITOR.

The next meeting of the "Goofy Gang" will take place at the home of our mineralogically inclined violinist—Bill Parrish. Bill has arranged an interesting program and the meeting promises to be one of unusual interest. Some of the things discussed will be the blowpipe class, the question of the election of officers for our group, the question of dues, of pins and the future possibilities of our organization. The idea of our sponsor, Mr. Cienkowski, in having chapters of our organization in the various high schools is already bearing fruit for at the Gratz High School there has been formed a mineralogical club which we hope will eventually affiliate itself with our organization. Remember, brother mineralogist, that you are a member of the Junior Mineralogists, the first society of strictly younger members interested in that most wonderful science of minerals and crystals. Be proud of your organization for there is none other like it. The term is drawing to a close and there will not be many more meetings so take advantage of this meeting and come out in full force. We want a 100 per cent attendance.

The meeting will take place this Friday, May 18, 1928, and the time is 8 P. M. Bring along minerals for sale, exchange, or giving away. So long till Friday.

THE PICTURE ON THE COVER

This interesting display with its most unique offer is in the show window of a well-established and reliable concern located in one of our large cities. Thousands pass the window daily and stop to admire the beautiful minerals and to read the extraordinary announcement posted therein. Full and complete details will appear in the next issue (September) of ROCKS AND MINERALS. Be sure and get your copy.

C. L. Clinton of Westfield, N. J., presents in this issue a little article on a microscopic mineral collection. This is naturally a most interesting and popular subject because every collector is confronted with the difficulty of finding enough room to properly and effectively display and house his mineral collection. Mr. Clinton is also keenly interested in cutting and polishing gems and gem minerals which he does at odd moments. Those who may desire to have minerals cut and polished can communicate with Mr. Clinton who will do this work at a reasonable price.

GLOSSARY DEPARTMENT

A list of various mining, mineralogical, and geological terms, with explanation of each one. Free use has been made of various publications on mining, mineralogy, and geology, including bulletins of the U. S. Bureau of Mines and the U. S. Geological Survey. Webster's New International Dictionary has also been consulted.

Alundum: An artificial abrasive used in the manufacture of oilstones and grinding wheels.

Alunite: A hydrous sulphate mineral of aluminum and potassium. Used as a source of potash.

Alunogen: A hydrous aluminum sulphate mineral which is frequently found on the walls of mines and quarries. Also called Feather alum and Hair salt.

Alurgite: A manganese mica that ranges in color from purple to red.

Amalgam: As a mineral it is a compound of native silver and native mercury. As an alloy it is a compound of mercury with some other metal.

Amazonstone, Amazonite: A green variety of Microcline feldspar that is often used as a gem. Pike's Peak, Colo., and Amelia Courthouse, Va., are two famous localities for this mineral.

Amber: A hard, brittle, translucent, fossilized resin, of a clear yellowish-brown or light-brown color. Often found enclosing insects. Used for ornaments, in jewelry, etc. Most famous locality for amber is the coast along the Baltic Sea in Germany. Also called Succinite.

Amblygonite: A rather rare mineral used chiefly for the extraction of its lithia. It is a fluo-phosphate of aluminum and lithium.

Amethyst, Amethystine quartz: A purple or bluish-violet variety of quartz often used as a gem. The color is due to manganese.

Amianthus: One of the finer and more silky varieties of asbestos.

Ammonia: A colorless gaseous compound of hydrogen and nitrogen with an extremely pungent smell. Used as a household compound, as a reagent in laboratories, etc.

Amorphism: The state or quality of being amorphous.

Amorphous: Without form. Name given to those rocks and minerals that have no definite crystalline structure.

Amphibole: A name given to a large group of minerals that are generally greenish to black, and of which hornblende is the chief variety. Amphiboles are very important rock-forming minerals of the igneous rocks, and resemble the Pyroxenes so closely in both chemical and physical properties that it is often impossible to distinguish between them unless they occur in well-formed crystals.

Amphibolite: A metamorphic rock consisting chiefly of some variety of amphibole, generally hornblende.

Amygdaloid, Amygdaloidal: A vesicular or cellular igneous rock, generally basalt, in which the small openings have been partly or wholly filled with a secondary deposit of calcite, epidote, native copper, quartz, some variety of zeolite, etc. A common rock in the Lake Superior copper mines.

The production of crude magnesite in the United States in 1927 was 121,490 short tons, valued at $1,090,550, according to statistics compiled by J. M. Hill, of the U. S. Bureau of Mines. The average price of crude magnesite was $14 per ton.

Molybdenite, the chief ore of molybdenum, is found near Peekskill along the Bear Mountain Bridge Road. At this locality granite is found intruding a schist and the molybdenite occurs as small flakes along the contact of these rocks.

THE BEGINNER'S CABINET

A Department for Young Collectors

Conducted by
ILSIEN NATHALIE GAYLORD

PENNIES

Last month we learned about one of the great giants of the earth, iron, which does a large share of the world's work. Today shall we have a little talk about that giant's mate, copper? Probably every small child in this country has had more than one specimen of copper for his own. To be sure, it was called a penny, or more correctly, one cent.

Pennies are English money, and somewhat different from our cents. But although the days are far gone when our country used English pennies, we still use the name. Our shiny red cents are not quite all copper. There is tin and zinc in them too. The right proportion of copper and tin makes bronze. And that is where the story of copper begins.

It was far back toward the old cave days when men first discovered copper. They did not know it was copper. They only knew that certain stones acted differently from other stones when the camp-fire heated them very hot. They found that after they were heated these stones could be molded into fine weapons and tools. The new implements were far better than the old ones that took so much work to make out of stone.

From then on, these primitive ancestors of ours took a long step forward. They could more easily destroy the great beasts that attacked them. They could make better dwelling-places and better garments. They had more leisure to think and plan new and better ways of living. It was almost like beginning a new life. We call that time, the Age of Bronze. It is called the bronze age because the stones were not pure copper. There was tin in them too. And as we have already learned, copper with tin in it makes bronze.

Our country had these same strange stones in it too, and our Indians went through their bronze age also. Only theirs was really more of a copper age, for many of their stones were pure copper. The Indians did not even melt them. They just pounded them into the tools and weapons that were needed. And where they made their weapons so long ago out of their curious stones, we have our great copper mines today. That is around Lake Superior, for still the same kind of strange "stones" are there in plenty.

THE COPPER FAMILY

It is quite a large family and most of its members are very handsome. Pure copper, itself, makes a fine specimen. It is about as red and shiny as a bright new penny. Once it was scattered all through the rocks near Lake Superior. Then some volcanoes began blowing up right there, and melted it.

That made the copper run into the cracks and holes in the rocks, where it hardened again. Long afterwards as the rocks crumbled, the masses of copper in them loosened and it was these pieces that the Indians found. In other parts of our country besides around Lake Superior there are deposits of copper, and always with it are several beautiful members of the family.

BLUE ROCKS AND GREEN BUBBLES

Two of these varieties of copper are azurite and malachite. You will surely want some specimens of these for your cabinet. They are strikingly beautiful. Azure means sky blue, and that is just the color of azurite. When water that has carbonic acid in it flows over certain copper rocks, it turns them this lovely sky blue color. Sometimes azurite is in crystals and sometimes in powdery rock masses.

Malachite is vivid green. It is practically azurite with more water in it,

which turns it green. So azurite and malachite are very often together in the same rock. They make beautiful specimens. Sometimes the rock is rich green, with a bright blue edge. Sometimes the malachite has been melted in the earth into half bubbles, like those in a thick hot pudding.

In Russia there is an especially beautiful green malachite. The Russian Czars were very proud of their green stone, and had it made into lovely vases and bowls and table-tops. These they gave as gifts to other royal people. More than ever we will treasure a specimen of malachite for our cabinet now that we know that even kings and emperors valued it enough for royal gifts.

In our great grandmothers' day they had to keep their copper kettles and pans always brightly scoured. If they were neglected a green tarnish formed on them. That was malachite, and came from the dampness in the air. Try leaving a penny in a damp place for a while and see what happens to it. Indeed, even in your cabinet your beautiful bright blue azurite will turn green, unless you keep it carefully covered from the air.

One other blue member of the copper family we must meet. That is chrysocolla. It is a blue-green shade, sometimes a turquoise blue, the loveliest of all the copper blues. Usually it looks like thick delicate blue paint that has been poured over the rocks and dried. But its most beautiful form is when it has stained quartz a sky-blue shade and crystallized. Then it looks like a delicious candy frosting. Chrysocolla, variety-drussy quartz, it is called. Without fail you will want one of these lovely specimens for your cabinet.

RUBY RED AND PEACOCK ORE

Now we must turn from the blues to a red member of the family. It is called ruby copper, although its real name is cuprite. Its crystals are bright ruby red, and where they have grown very long and slim they look like rich red velvet. It is this red copper that glass-makers use to give the glass a beautiful ruby color. Other varieties are used to make it blue or green or violet.

One last kind of copper we must know about, and then we have met most of the good-looking members of the family. This last one is fairly gorgeous with rich shining metal colors, copper and bronze and purple and blue and gold. Of course, with all these colors, people have named it "peacock ore."

Pure copper, blue azurite, green malachite, turquoise chrysocolla, yellow pyrite, and peacock ore, all these make up the handsome copper family. You can imagine how showy they look in one's cabinet. But of what use are they to man? Great sheets of copper are fastened to the bottom of ships to protect them. Telegraph and other electric wires are made of copper because electricity travels faster along copper wire than along any other kind. Dyes for coloring cloth and paints are made from other copper forms.

There is almost no end to the ways we have made copper useful to us. And there is almost no end to the places where copper can be found. Not only is it in the rocks, but there are traces of it in some of the flowers and plants, and in the ocean water and sea-weeds, in some of the animals and in eggs, sometimes even in blood. Most certainly copper does its share of work in the world.

LEAD PENCILS AND DIAMONDS

Did you know that once your lead pencil was alive? Not just the wooden outside part. That we know was a piece of a cedar tree only a little while ago. But the inside black lead was once alive too. Probably it was a fern. And, by the way, that is not lead at all in your pencil. It is graphite. What graphite is, makes a long story. The story began 500,000,000 years ago. That is when the first graphite was formed on earth.

Ever since then graphite has been forming in the earth, and that is how it comes to be there and why your pencil was once alive. It was about 100,000,000 years ago that your pencil graphite was made. Then the whole world was warm, even where the snowy arctic is now. And in many places, there were vast stretches of swamps, something like those of Florida today. In that warm air the trees and ferns and mosses grew so fast and so large, they made great jungles in the swamps.

Our little club moss which now is a vine growing close to the earth, in those ancient times was a great tree eighty feet tall. Some of the ferns, too, grew into trees. A few like them are left yet in our tropics. Although men did not live in those faraway days, we know that all this is true because we find the fossils of the trees and ferns and nuts that grew in that long ago age.

Just as they do now, so in those olden jungles, fallen leaves and vines and trees covered the swamp bottom. Giant ferns withered and lay prostrate. Nuts and seeds fell among the litter. Bog moss was everywhere. Gradually sand and mud washed over all this debris. That shut out the air and slowed down much of the decay on the swamp bottom. It was as though the drafts on a stove had all been closed. Only very slowly could the fire burn then.

That is what decay always is, chemicals acting upon one another like the smothered burning of a fire. So the old jungle swamp bottoms slowly burned on and on until nothing but charcoal was left of the trees and ferns and other wastage. All this time the sand and clay-mud that washed over them was growing thicker. Finally it was solid as stone. Then came great upheavals of the earth and tremendous heat. That baked the charcoal into graphite.

So now you see how your pencil "lead" really is burned-up ferns and forest waste that once grew in a jungle millions of years ago.

BLACK DIAMONDS

Black diamonds are the steps between charcoal and graphite. We call these steps hard and soft coal. In some places there did not come the tremendous heat to the beds of swamp wastage. So those beds gradually grew more and more closely packed as the layers grew thicker and thicker. At last they were almost like soft black stone. But it was stone that would burn, and we call it coal, soft coal. In other places where the earth upheavals did bring great heat to the soft coal beds, they were baked into hard coal.

Because this hard coal is so shiny black and breaks like a crystal, people call the pieces of it "black diamonds." Of course, those are only fanciful reasons for connecting it with diamonds. But there is a true reason for doing so, because coal and real diamonds actually belong to the same family. Strange ways of nature, to make close relatives of common coal which costs only a few dollars a ton, and diamonds which are so small and cost so many dollars each.

This is how they are related. Plants are made largely of the mineral called carbon, and it is carbon which is left behind when trees and plants decay. The black which clings to your fingers when you pick up a damp decayed stick is carbon. Because coal is made of decayed swamp ferns and trees, of course coal is really carbon, black carbon.

In the long ago times when the coal beds were forming, if the upheavals brought enough terrific heat to the hard coal it was baked still more, baked until nothing was left but carbon. This baked form of carbon is called graphite. That is what your pencil "lead" really is, you remember. It is the old swamp wastage baked past the charcoal stage, past the soft and hard coal stages into graphite at last.

Graphite is uncrystallized carbon. Diamonds are crystallized carbon. That is how your pencil graphite and diamonds are related. They are only different forms of carbon. We know that diamonds are made of carbon, because a French chemist made some diamonds out of carbon in his workshop. They were very tiny, for it is exceedingly expensive work to make them. It does not pay to do it. They cost far more than the diamonds which nature has made. But at least it proved to us how nature made hers.

It shows us, too, what strange relations there are among the minerals. Graphite is the softest of the minerals, and black as night. A diamond is the hardest of all stones and clear as light. Graphite is used for stove polish and other lowly work. Perfect diamonds have no work to do at all, except to be beautiful. Graphite costs comparatively little, and there are diamonds whose value is several million dollars each. From all this it would seem that the mineral family also, as well as the human, has its wealthy idle aristocrats, and its poor hard-working relations.

OTHER HARD-WORKING MINERALS

Who would ever suspect that the fuzzy white asbestos in the back of our gas fire-places was going under a false name? Minerals are very much like people in some ways. However, asbestos has a good reason for its alias, since it comes from not only one mineral family but from several. Small wonder it needed a name all its own.

One family name belonging to asbestos is tremolite. Tremolite is a mineral which we find made of long fine white crystals. Sometimes the crystals grow six feet long and fine as thread. They are strong crystals and bend so easily that they can be woven into cloth. The

fire-proof curtains in the theaters are made of these woven crystals which fire cannot burn. That is how they came to be named asbestos. It is a Greek word which means fire-proof.

Another mineral family which claims asbestos as one of its members is serpentine. Serpentine is a soft green rock, sometimes spotted with irregular patches of red or yellow or white. It is this blotched appearance like the patterns and coloring on snakes that makes people call it serpentine. Quantities of this serpentine rock is found in the Province of Quebec, Canada, and all along our Eastern coast and in California.

Serpentine asbestos is in veins in the rock, in silky green fibers. But when it is fluffed up like wool or cotton it turns creamy white. It is used to pack around steam pipes, and for fireproof linings in safes, and in many other places where fireproof protection is needed. Some of the clothes of firemen are made of asbestos cloth. For thousands of years people have known how to use asbestos. We have proof of this, because when the old Egyptian tombs were opened the mummies were wrapped in cloth made from asbestos.

You will want specimens for your cabinet of these different varieties of asbestos. One kind is dark blue and called crocidolite. Then the long silky white fibers found in tremolite make a fine specimen. And polished pieces of serpentine splashed with red or yellow or white are beautiful. All of these different kinds of rocks have sections in them of long delicate crystals like fibers. It is these crystal fibers which we call asbestos, whichever may be the rock where they are found.

TALC AND SOAPSTONE

Mineral twins these are, being of the same family and usually found together. Also like some twins, while they look very much alike they are not wholly so. Talc is found in layers something like the sheets of mica. It is a pretty mineral, silvery apple-green in color and with a pearly sheen. When the layers are scaled off, they will bend but not snap like mica which is much more brittle.

Very soapy is the way talc feels as you handle it. That is why people call it soapstone, but soapstone is just a little different from talc. While it is the same kind of mineral, it is found in earthly masses rather than in sheets or layers. And it is usually white or a light blue-gray in color. It, as well as the silvery green talc, is found with serpentine rocks.

Like asbestos, talc and soapstone are hard workers too. They are so soft they can be cut with a knife. Because of this, and because of their silvery sheen and delicate colors, for centuries they have been carved into vases and images and jars. The Chinese are especially clever in making talc ornaments, carving it into patterns of shaded green leaves and vines. Even the Indians used to shape it into great jars and into peace pipes.

But we are the ones who have given soapstone the hardest work to do. We quarry it into thick sheets for hearthstones and laundry tubs. We crush it to use in soap and talcum powder and paint, and compress it into crayons. Much of the "French chalk" is made of talc.

It will not be difficult to get specimens stone for it is very plentiful. All along the eastern part of our country, in the Rocky Mountains, and on the West coast it is found. Indeed, we use thousands of tons of it in making paper and roofing, and soap, and all sorts of other useful things. Most surely, talc and soapstone belong to the hard workers among the minerals.

JUNE BIRTHDAYS AND PEARLS

Is your birthday in June? Then a pearl is your birthstone. Stone? Is a pearl a stone? Indeed, yes. To be sure, a little water creature makes it, but it is made from the mineral aragonite. Even the shells of most of these small water-folk are made from a certain stone. It is a stone which the water has dissolved, and which will be gathered again into compact stone as the little creatures die and their shells sink to the ocean floor.

These hardened layers of shells on the ocean bottom are limestone, for it is out of the lime in the water that the small sea creatures make their shells. Untold centuries pass as the lime layers slowly accumulate from the sunken shells of the little water creatures who have died.

As long ages pass, the lime beds accumulate to many feet in depth. Then in time come great earth upheavals which lift the limestone layers into high cliffs. In turn these are washed down again by the rains and dissolved in the waters of rivers and seas. Then more shells are made from it by the new generations of small shell-folk who live there.

While most of the shell is made of

lime, the inside layer next to the little shell animal is made of aragonite. That is what gives the shell its beautiful pearly look. We call it mother-of-pearl. In the East Indies and Mediterranean seashore countries quantities of this mother-of-pearl lining is cut in pieces from the shells, and used to ornament furniture, and for beads and other jewelry.

Even the very small children of the orient are expert at cementing these little mother-of-pearl pieces of shell onto jewel boxes and frames and furniture. Their parents have done the work for generations and the skill is practically born in their children. There is no law in those countries, such as we have here, which forbids little children from laboring.

About the pearls themselves. When a tiny grain of sand slips far under the shell-creature's soft body, it scratches the soft flesh and is very irritating. So the shell-animal oozes out some shelly liquid over the annoying sand grain. This liquid soon hardens. Then another and another layer of it is formed. At last the sand grain is in the center of a small round ball of pearly shell. We call these little balls pearls.

If there is a pink lining to the shell, the pearl will be pink too. Yellow shells make yellow pearls. A few have been found of other colors, but usually pearls are white or cream color. Thousands of dollars are paid for especially fine ones. And many of the most beautiful ones have been placed among the gems in royal crowns.

However, regardless of their color or price, pearls are made of aragonite. It is a part of the limestone which is dissolved in the water and taken up by the small water animals to line their shells. But it is the crystal form of aragonite that makes interesting specimens for the cabinet. Needle-fine are most of the crystals of aragonite, clear as glass or snowy white.

Masses of snow-white aragonite are beautiful. But it is still lovelier when it is shot through here and there with a bright green stain, or tinged with pale green like thick ice.

These last forms of aragonite are found in some of the caves, where they hang like great icicles from the cave roof. You will surely want one of these crystal icicles which will never melt away and lose its beauty as real icicles do. It will make a strikingly showy specimen in your cabinet.

RED FLARES AND GREEN

Juiy 4th! Evening. Everyone celebrating. Red flares over here, green and yellow fire-balls over there, rainbow pinwheels sparkling everywhere—a riot of flashing lights. Where do they come from, these gorgeous flaring colors? Well, this bit of powdered mineral right here can tell you about some of it. It can tell you about the red part, for it is strontianite. When strontianite burns, its color is a rich crimson red.

It is hard to believe that, when you look at a piece of strontianite, for strontianite itself is pale green, or sometimes pale yellow or white. Who would ever suspect a green stone of having a flame of fiery red? But many strange habits have these minerals which come to us from unexplored depths of the earth.

Like aragonite which makes the pearls, strontianite with its red flaming heart comes from the limestone. Water seeping and straining through the rock gathers the strontianite into little pockets and veins. There we find it in needle-fine crystals and masses. A drop of muriatic acid will make it bubble and phizz.

Closely related to strontianite is another mineral, celestite. As you can guess from its name, it is pale sky blue. It, too, flames with a bright red color. A green stone with a red light. A blue stone with a red light. There is no accounting for the surprising things that minerals will do. The celestite crystals are not needle-like. They look like flat tablets or plates piled side by side. Sometimes the blue pales out to white.

Beautiful blue celestite crystals used to be found in a cave on Strontian Island in Lake Erie, but now they have all been mined away. However, celestite is scattered all across the United States, so be sure to search carefully for it in any limestone rocks near you, or in limestone caves. Strontianite, too, is quite apt to be wherever celestite is, since celestite is really a variety of strontianite. There is no knowing what beautiful crystals of each of them you might happen to discover.

Now for the green light. That comes from burning barite. Large clear or white barite crystals are often found, either in the shape of prisms or tablets. Masses of barite are common, too, sometimes red or yellow or white or gray. Much of it comes from lead or iron mines, but it is found in the limestone, also, where you find so many interesting specimens.

Every once in a while we hear of someone who has a double, a person who looks almost exactly like them. Among the minerals, too, we now and then find "doubles." It is quite likely that some of your barite crystals may look very much like your celestite ones. But just touch the barite with a drop of acid and it will show you that it is not celestite. Celestite will bubble under the acid, but barite will not. Another test is that celestite burns with a red flame and barite with green.

So these are our red and green celebration flares. Charcoal or sulphur or other minerals are mixed with them to make their exploding sparkles and quick burning. But it is the minerals we have just studied which give the bright colors. An interesting group they will make in your cabinet, these Fourth of July color-flare minerals.

WITH OUR CONTRIBUTORS

Frederick A. Burt, who is Professor of Geology in one of the large universities in Texas, has given us the very complete article on gold which appears in this issue of Rocks and Minerals. Gold is a fascinating subject to almost everyone and is a mineral which many men have lost their lives in seeking its discovery. We feel that we are very fortunate in obtaining this interesting article and we hope that Professor Burt may find time to write us another article for a future issue.

A new contributor to this issue of the magazine is P. Walther of New Jersey and he has shown his interest in Rocks and Minerals by sending us no less than eleven articles the first of which appears in this issue and entitled: "The Origin of the Native Metals." We appreciate this very kind manisfestation of Mr. Walther's interest and desire that Rocks and Minerals may be well-supplied with articles.

A new contributor but an old friend to those of our readers who years ago received *The Mineral Collector* regularly, is Albert C. Bates of New Jersey. Mr. Bates is another of our sincere friends who is keenly interested in seeing Rocks and Minerals grow and prosper and his many kind letters of encouragement have been most helpful. We would like to call the special attention of our readers to the Editorial Section in this issue where a brief review of Mr. Bates' interesting article can be found.

We are pleased to feature in this issue "A Mineral Study Project" by Mrs. Herbert E. Ives of New Jersey. The Project as outlined by Mrs. Ives should be of interest and value to all of our readers who are desirous in extending the fascinating study of minerals among the younger generation by training adults to act as instructors. Mrs. Ives is keenly interested in this work and as it has met with such unusual success we hope that some of our readers will try out a similar plan in their own cities. A brief review of the project appears in the Editorial Section of this issue.

PUBLICATIONS RECENTLY RECEIVED

The Mineralogy of Hafnium: By O. Ivan Lee. Reprinted from *Chemical Reviews,* Vol. V, No. 1, February, 1928—pages 17-38, 6 figures and 3 tables. This is a most interesting pamphlet on one of our recently discovered elements. Mr. Lee is not only intensely interested in minerals containing rare metals but is an authority on them also and his many excellent contributions to ROCKS AND MINERALS under "Notes and News of Minerals of the Rarer Elements" is a feature that is much appreciated by many of our readers.

Mining of Thin Coal Beds in the Anthracite Region of Pennsylvania: By Dever C. Ashmead of the U. S. Bureau of Mines—113 pages, 57 illustrations. Issued recently as Bureau of Mines Bulletin 245—price 30 cents.

Safety in Coal Mining (A Handbook): By George S. Rice of the U. S. Bureau of Mines—141 pages, 1 figure. Issued recently as Bureau of Mines Bulletin 277—price 25 cents.

State Laws Relating to Coal-Mine Timbering: By J. W. Paul and J. N. Geyer—57 pages. Issued as Bureau of Mines Technical Paper 421—price 10 cents.

The above three publications can be obtained only at the prices quoted from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

Thirty-sixth Annual Report of the Ontario Department of Mines, Toronto, Canada, was recently issued as Vol. XXXVI, Part 3, 1927. It contains 119 pages, 15 illustrations, 18 sketch maps, sections, and diagrams, and 3 colored geological maps in pocket.

Specific Gravities of Minerals: An index of some recent determinations — pages 337-365. This little publication should be of interest to all collectors who are desirous of experimenting with minerals in determining their specific gravities. The method used is a most excellent one and the list of minerals whose specific gravity have been determined should be appreciated by all.

Corundum Twins from Transvaal: Pages 329-336, 5 figures. Those of our readers who may have corundum crystals from this noted locality will be interested to hear that twin crystals occur quite frequently and it may be possible that they possess such crystals without knowing it.

South African Occurrences of Willemite. Fluorescence of Willemite and Some Other Zinc Minerals in Ultra-Violet Rays: Pages 388-396. This publication will be of chief value to those who are especially interested in the phosphorescence of minerals.

The above three most interesting publications are by L. J. Spencer, M.A., Sc.d., F.R.S., Keeper of Minerals in the British Museum (Natural History), and are reprinted from the *Mineralogical Magazine,* December, 1927, Vol. XXI, No. 19. Published by Mr. Humphrey Milford, Oxford University Press, Amen House, Warwick Square, London, E.C. 4, England.

Crystallographic Tables for the Determination of Minerals: By Victor Goldschmidt and Samuel G. Gordon. Issued by the Academy of Natural Sciences of Philadelphia, Pa., as Special Publication No. 2. Price $1.50. Doubtless many persons interested in the collection or study of minerals have felt the need of a convenient reference list of species. This desire can now be gratified in the excellent work by Victor Goldschmidt of Heidelberg, Germany, and Samuel G. Gordon of Philadelphia.

While the book is intended primarily for the determination of minerals by crystal measurements, it is easily the most useful and compact reference work on minerals available. To quote the authors — "All minerals have been included whose specificity is attested by crystallographic data, optical distinctness, mineralographic homogeneity, or a unique chemical composition."

The tables contain all species described to date to the number of 1025, and include 192 doubtful species and varieties. For each mineral one may find listed the chemical composition, hardness, specific gravity, color, luster, form and other data and a complete index refers one immediately to each.

To the collector and average mineralogist this work is recommended as a handy reference for the information he is seeking. The index may also be used as a check list of the species in his collection.

HARRY W. TRUDELL, *Treasurer,*
Philadelphia Mineralogical Society.

EDITORIAL

"Disposition of Mineral Collections," by Albert C. Bates, which occurs in this issue of ROCKS AND MINERALS is a rather sad story reflecting the lack of interest and pride of the people of a state in permitting what was possibly the finest collection of minerals of the State of New Jersey to go to an outside institution. While Mr. Canfield's collection included specimens from all over the world it was specially noteworthy for its representation of the many choice minerals from New Jersey. This is possbily typical of the common attitude toward mineral collections on the part of the general public. We know Mr. Bates' article will be read with a great deal of interest by all of our members and especially by those having collections that are really noteworthy as representative of particular localities.

It is to reawaken a general public interest in mineralogy that ROCKS AND MINERALS is printed and our experience thus far has not been very different from that of *The Mineral Collector* with which Albert C. Bates was connected for a time. *The Mineral Collector* was established in 1894 by Arthur Chamberlain and Albert C. Bates who associated as partners and published the magazine at a loss but made an effort to keep it going just for the pure love of the thing. Mr. Chamberlain and his brothers were printers and Arthur Chamberlain, who worked during the day, spent his nights at his brothers' shop in Jersey City, setting up type, making up the forms, and printing the magazine. While this kept down the expense the advertisements were actually printed at less than the cost of production. Mr. Bates retired as partner at the end of the first year but continued to be interested by maintaining the headquarters of the magazine at his New York offices, seeking and accepting ads and subscriptions to the magazine, and furnishing all the original copies possible. Mr. Chamberlain continued the magazine until 1908 when it was discontinued. Thus passed forever a most worthy, honorable, instructive, interesting, and fascinating magazine. Since the days of the old *Mineral Collector* no similar magazine has been printed, so far as we know, until the appearance of ROCKS AND MINERALS. And we hope that our many friends and subscribers will be with us at all times, encouraging our efforts with new subscriptions, advertisements, articles, or suggestions, so that ROCKS AND MINERALS may become one of the leading magazines of the country, stimulating and awakening a new and greater interest in mineralogy.

Benjamin T. Diamond, one of the Honorary Vice-Presidents of the Rocks and Minerals Association, and a palaeontologist of note, will receive his Master of Arts degree from Columbia University this month. He has been majoring in Palaeontology and his thesis subject is: "The Oligocene Foraminifera of Palma Real, Vera Cruz." While deeply interested in palaeontology, Mr. Diamond, who is now connected with the high school system in one of the large cities of the country, is desirous of teaching palaeontology or general geology in some college. Any of our subscribers who may know of such an opening will confer a favor by addressing Mr. Diamond in our care.

The following excerpts are taken from a most interesting letter recently received from one of our subscribers in Transvaal, which is in that far-off, dark and mysterious continent of Africa.

"I take pleasure in enclosing money order for 9/ (about $2.25) as renewal to ROCKS AND MINERALS for the remainder of 1928 and for the entire year of 1929. . . . Allow me to compliment you on your very fine magazine, ROCKS AND MINERALS, that you are bringing out for

EDITORIAL—Continued

our benefit. I certainly look forward with eagerness to my copy when it is due. I do enjoy the articles on visits to various localities and on methods adopted by certain mineralogists in housing their collections. The "tips" contained in the latter articles have been most helpful to me in arranging my own collection. I hope to see many more such articles. To my mind there is nothing in the magazine that I would wish eliminated, and ROCKS AND MINERALS is simply crowded, from cover to cover, with good, helpful, and instructive reading. . . . While in Pretoria recently I spent a few hours at the Geological Survey Museum to see some of the latest "finds" exhibited there. Two of the most interesting specimens were copper-stained Limonites in which were embedded three(two in one and one in the other) very showy crystals of Sperrylite. These specimens came from the workings on a farm named Tweefontein, ten miles north northwest of Potgietersrust, Transvaal. Mr. O. Ivan Lee mentions in his excellent article under "Notes and News of Minerals of the Rarer Elements," Vol. 1, No. 2, p. 25, ROCKS AND MINERALS, that crystals of Sperrylite were found in Rhodesia, whereas the above locality is the only one known in Africa. The specimens of Sperrylite in the museums at Pretoria, Transvaal; London, England; and Cambridge, England, all came from the above locality. I am sure Mr. Lee will be interested in knowing this. . . . By the way, South Africa now has the distinction of possessing the deepest shaft in the world. The Tuof Shaft of the Village Deep Gold Mine, Johannesburg, Transvaal, last month (March) reached an extreme vertical depth of 7,675 feet and is being continued still further. To enable the miners working at such a depth a chance to carry on, ice blocks are placed in the main ventilating columns and compressed air is played on same so as to reduce the very high temperature underground.

We would like to call the special attention of our readers to "A Mineral Study Project" that appears in this issue. This is an article by Mrs. Herbert E. Ives on the formation and very successful conduct of a course in minerals for those who have had perhaps no previous knowledge of the subject. It not only affords suggestions as to what can be accomplished but also the interest that can be awakened in this most fascinating study. We wish to congratulate the Women College Graduates who organized this class and worked out its very practical course and upon the unusual success which has apparently crowned their efforts. We feel that they have rendered a valuable service to the people of their community in arousing a desire among them to know something of the mineral resources of their State. We would like to suggest to our readers that similar courses in other communities during the winter seasons would be of profit and interest to many of their neighbors and friends who perhaps have never thought of a mineral as other than an ordinary stone of the earth.

Quite a number who took this course have become subscribers to this magazine and members of the Rocks and Minerals Association.

In two of our large cities on the Pacific Coast, considerable interest is being manifested, by some of our members, in organizing a local mineral club and affiliating with the Rocks and Minerals Association. Their plans are to unite all mineral collectors in their respective cities and neighboring sections into one large club whose headquarters will be at the offices of one of the sponsors. A nominal sum will be charged each member as dues. The advantages of such a club are many. It will bring together collectors from all parts of the city and nearby towns, thus new friends will be made who shall have a common interest—minerals. Arrangements can be made to visit the home of each member for the purpose of examining his collection. At meetings, which may be held regularly, members can prepare and read articles, exhibit minerals, express views and ideas, and plan trips and excursions to nearby museums, mineral localities, etc. Thus a member will make new friends; receive excellent ideas and suggestions how to arrange his own collection; an opportunity to see and examine other collections; visit mines, quarries, museums, and other places of interest; his interest in minerals will be greatly increased and his knowledge broadened, etc.

We extend to the members in these cities our sincere good wishes that their plans may be carried out and their club prosper and grow. We hope our members in other cities may try out something similar.